# FLIGHT

The AIRCRAFT ENGINEER AND AIRSHIPS

**First Aeronautical Weekly in the World. Founded January, 1909**

Founder and Editor: STANLEY SPOONER

**A Journal devoted to the Interests, Practice and Progress of Aerial Locomotion and Transport**

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM

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**1932**

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**June 17-19.** Isle of Man Race.
**June 18-July 1.** National Aviation Day Displays. (See p. 538.)
**June 18.** Nottingham F.C. Air Pageant, Tollerton Aerodrome.
**June 18.** Hull Air Display.
**June 18.** Reading Ae.C. At Home, Woodley Aerodrome.
**June 19.** Royal Aeronautical Society Garden Party, Hanworth.
**June 21.** Aero Golfing Society: "Flight" Challenge Cup. Bramshott G.C.
**June 21-28.** Blackpool Air Pageant, Stanley Park.
**June 25.** R.A.F. Display, Hendon.
**June 25-26.** International Tourist Rally, Boulogne.
**June 26.** "Tatler" Concours d'Elegance, Brooklands.
**June 28.** Visit to National Physical Laboratory, Teddington.
**June 29-30.** Cricket: R.A.F. *v.* Army at the Oval.
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**July 2.** Opening of Portsmouth Municipal Aerodrome.
**July 2-3.** International Tourist Rally, Rheims.
**July 3.** Meeting at Cote Hill Aerodrome, Rugby.
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**July 8-9.** King's Cup Air Race, start and finish Brooklands.
**July 9.** R.A.F. Athletic Championships at Uxbridge.
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**July 14.** International Rally, Saint-Brieuc.
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**July 22-31.** International Meeting, Zurich.
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**Aug. 20.** Ryde Air Pageant.
**Sept. 3.** Leicester Chamber of Commerce Day, at Desford.
**Sept. 4.** Divine Service at Ratcliffe Aerodrome, 2.30 p.m.
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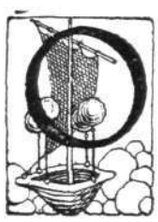
**Sept. 8.** International Meeting, Vincenza, Italy.
**Sept. 24.** Air Display at Hillmans' Aerodrome, Gallows Corner, Brentwood.
**Sept. 25.** Gordon Bennett Balloon Race, Basle.
**Oct. 1.** Bristol and Wessex Ae.C. Garden Party.
**Oct. 18.** Aero Golfing Society: Cellon Challenge Cup, West Hill G.C.
**Nov. 18-Dec. 4.** Paris Aero Show.

### *THE ROYAL AIR FORCE DISPLAY*

*Lest you forget, June 25 is the day fixed for the Thirteenth Royal Air Force Display at Hendon—undoubtedly the Premier Aeronautical Event of the Year. The coming Display will include many new and attractive items which should not be missed!*

# EDITORIAL COMMENT



ON Sunday, June 12, the Hon. H. U. Moffat, Premier of Southern Rhodesia, arrived at Croydon from his own country by Imperial Airways service *en route* to the Empire Economic Conference at Ottawa. This is, we believe, the first occasion on which a British Premier has flown all the way from his own country to Great Britain on Empire Service. Lord Strickland, Premier of Malta, once flew from Marseilles to Great Britain, but he left his own country by steamer. Mr. Moffat holds the distinction of being the first Premier to fly all the way. His journey was one of some 7,000 miles completed between June 3 and June 12, and at the end he arrived at Croydon 10 minutes ahead of schedule time. The Ottawa Conference is some time ahead, but that consideration does not detract from the significance of Mr. Moffat's journey. Presumably he has business to transact in London before he sets out for Canada. At any rate, he has not been obliged to spend in travel valuable time which he can now employ otherwise. He will very likely be active in exploring the possibilities of increasing the market for Rhodesian tobacco, of which five million pounds are now exported annually to this country. Mr. Moffat said in an interview that he hoped to get help in increasing this export figure, and perhaps he hopes to be able to export to other parts of the British Empire besides Great Britain. Such things are not arranged in the twinkling of an eye, and there is every likelihood that the time which Mr. Moffat has

**On Empire Business**

saved by travelling by air will be put to very good use.

From the time when Empire air lines were first discussed, the possibility of Empire Premiers saving time in travel was one of the great advantages put forward. What was foreseen has now begun to come to pass, and it is this which lends special interest to this journey of Mr. Moffat. We have not yet heard if the Indian delegates to Ottawa intend to fly to Great Britain by Imperial Airways machines; but if they do not adopt that means of travel this year, there is no doubt that before many years have passed the aeroplane will be accepted as the regular means of official travel. The Viceroy has already started to tour India by aeroplane, and external communications are at least as profitable as internal flights for Indian officials. It is still the Premiers of Australia and New Zealand who stand to gain most by Empire air lines, and the absence of a line from India to these two Dominions remains our greatest cause for regret.

❖ ❖ ❖ ❖

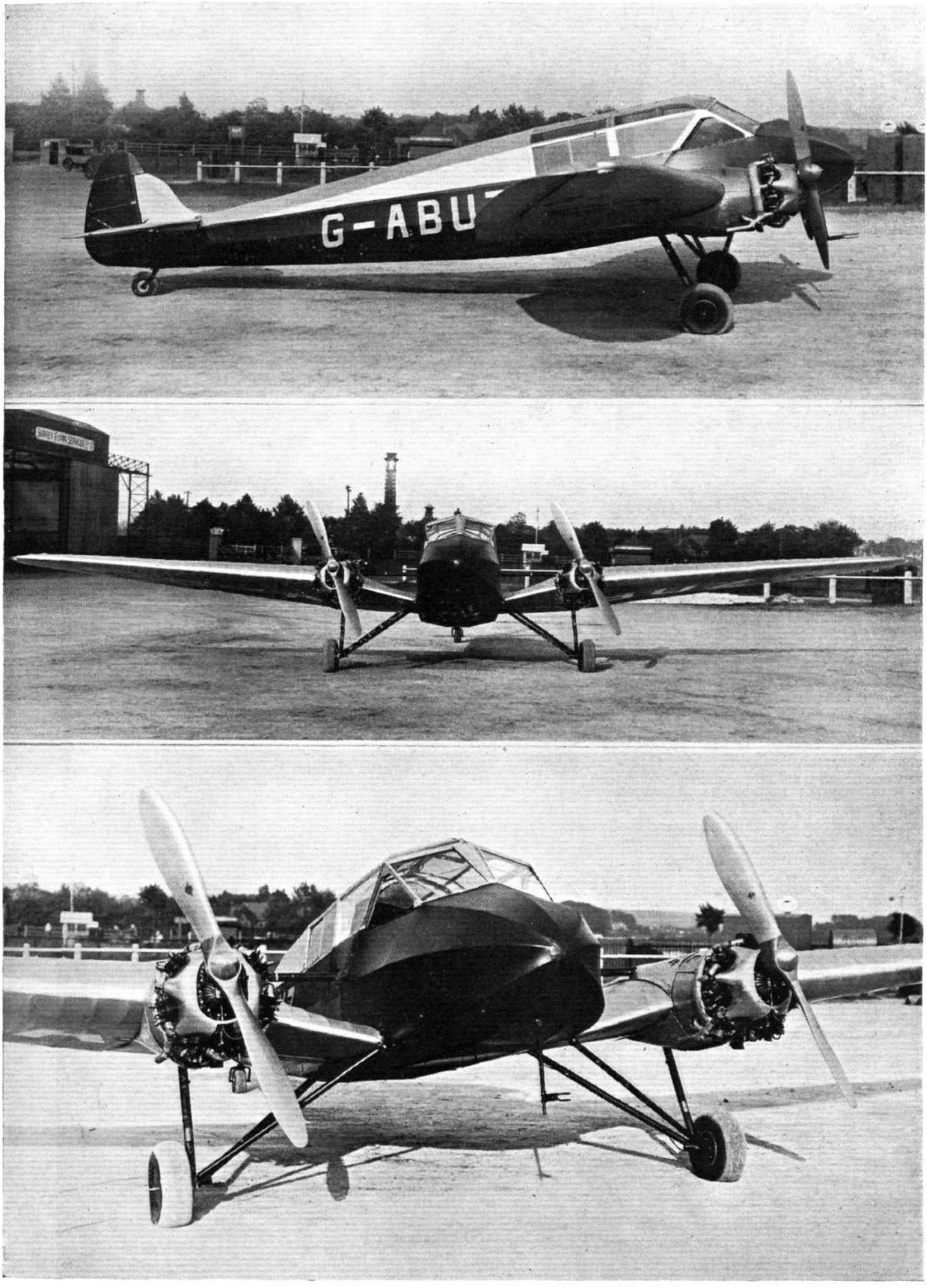
**Private Enterprise in India**

We have alluded briefly in recent issues to the agreement entered into by the Government of India with the Parsi firm of Tata Sons, Ltd., for the carriage of mails each week by air between Karachi, Bombay and Madras. The grant of air-mail contracts to unsubsidised firms has been a common feature of civil flying in Canada, but we believe that this is the first extension of the principle to other parts of the Empire, and certainly in the case of India. India is a country where a certain form of socialism is rampant, and when a thing ought to be done the tendency is for everyone to ask the Government to undertake it. Parsis, however, are renowned for their spirit of enterprise in business matters, and among the Parsi race (who, we may explain, are a colony of immigrants from Persia who have clung to the Zoroastrian religion and refused to embrace Islam) the family of Tata are pre-eminent in this matter of enterprise. Their great iron and steel works are world-famous. One of the partners of the firm, young Mr. J. R. D. Tata, is a flying enthusiast, and has flown his own machine from India to England. His wife, if we remember right, is also a qualified pilot, both having learnt to fly at the very live flying club of Bombay.

Though the Parsis are found engaged in business all over India, they are always a Bombay people, and have the interests of the Western capital at heart. The air mails arrive at Karachi, also a Western seaport, but one far to the North, and a city for whose aspirations Bombay feels no sympathy. As yet there is no air connection between Karachi and Bombay, while by train or steamer the journey between the two takes two days, except when an occasional express steamer makes the trip in 30 hours. An air letter addressed to Bombay could be expedited somewhat by a payment of an extra two annas, when the State Airway would take it as far as Jodhpur, whence a car would take it 80 miles to Falna junction to catch a train on the metre-gauge line to Ahmedabad, where it joins the main broad-gauge line to Bombay. This roundabout proceeding, which required no little *bandobast* (as Indians call organisation) did not remove the need for a direct air service to Bombay. Consequently in 1929 the Tata firm started negotiations with the Government of India on the subject. They asked for no subsidy, but for a guaranteed pay-load, and it was reckoned that the liability of the Government would not have exceeded Rs. 6,500 p.a. However, in those days it was held that there was no type of British aeroplane of the requisite size, price, and performance for this particular sort of work (the average weekly weight of air mails for Bombay and other places south of Karachi was 200 lb.), so it was proposed that foreign machines should be used. To this the Government naturally would not agree.

The production of the "Puss Moth" in 1930 changed the situation. The Tata firm bought one of these machines and Mr. Vincent flew it out to India. Negotiations with the Government were then resumed, and various proposals were made, but none was accepted until the present year. The final terms agreed upon have not yet reached this country, but it is understood that rates will be on a sliding scale, the Government paying the firm so much per lb. per distance, with no guaranteed pay-load. Mr. Vincent, who was previously technical adviser to the Tata firm, and then for a while was appointed Deputy Director of Civil Aviation, has now returned to the service of the Tatas. Thus there is every reason to feel assured that the technical side of this new service will be all that it ought to be, while on the economic side there is a feeling of confidence engendered by the consideration that the enterprise is not being started by men who are merely air enthusiasts, but by a very shrewd and far-seeing business firm. The start of the service is being postponed until September, when the monsoon is on the point of conclusion. Every new service, like every new aeroplane and every new engine, has its teething troubles, which have to be discovered in actual operation, and there would be no wisdom in finding out those troubles amid the added complication of furious storms raging round the summits of the Western Ghats range. In the delightful weather of an Indian autumn and winter, the new service will be able to find its way to that clockwork regularity which must be the aim of all air services. Then, by the time the next monsoon breaks, the pilots will have plenty of experience of all the normal problems and will be able to judge how the new ones ought to be tackled.

It is stated that the service is to be extended from Madras to Ceylon as soon as certain matters have been arranged. At Colombo the aeroplanes will make contact with the mail steamers going east to Australia, and consequently there will then be a real advantage in sending letters for Australia by air to Karachi and on by air to Colombo. Thus the great cities of Bombay and Madras will both benefit, and Australia likewise. The project is an ambitious one, and at the same time an eminently practical one, worthy of the far-seeing firm which has proposed it and undertaken it. We congratulate the Tata firm on their wisdom, and we most sincerely wish their private air service all the success which it deserves.



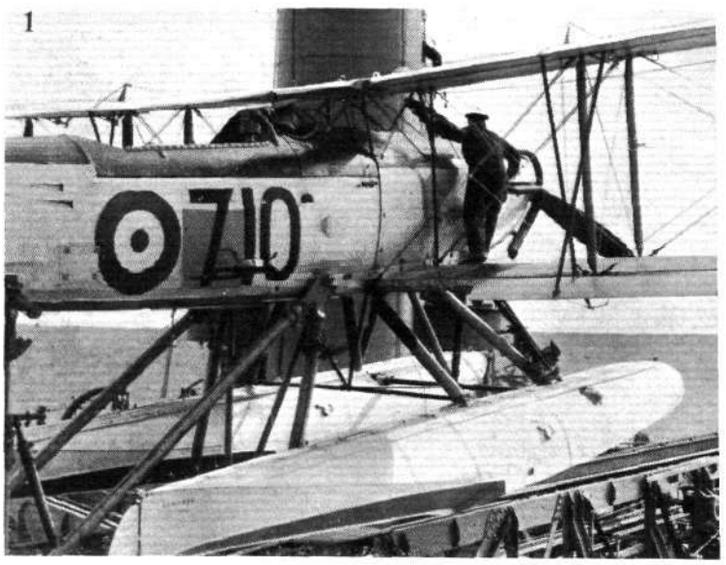

THE ST. 4 : The first of the General Aircraft Monospar machines has now been repaired after its recent mishap, when it collided with a fence and damaged a wing tip. The machine has already flown for more than 5 hours and is said to handle very well, while the landing speed is remarkably low. (FLIGHT *Photos.*)

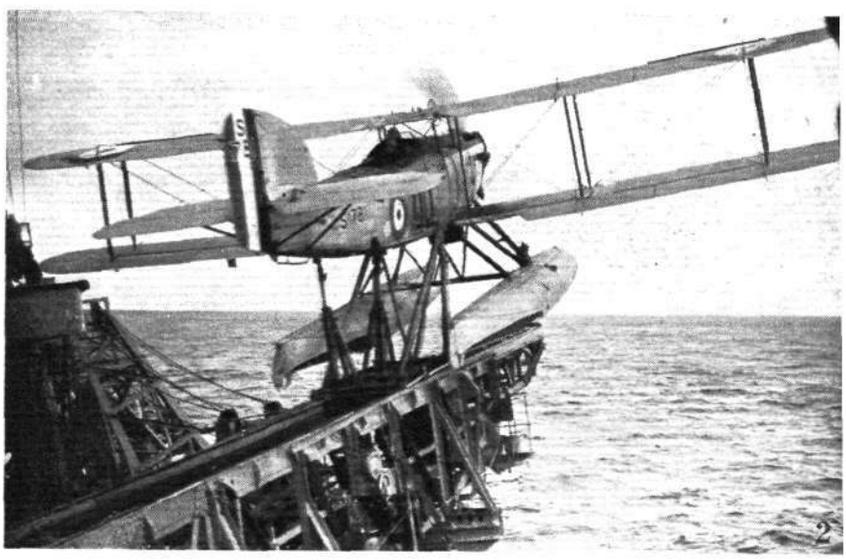
# A Naval Occasion

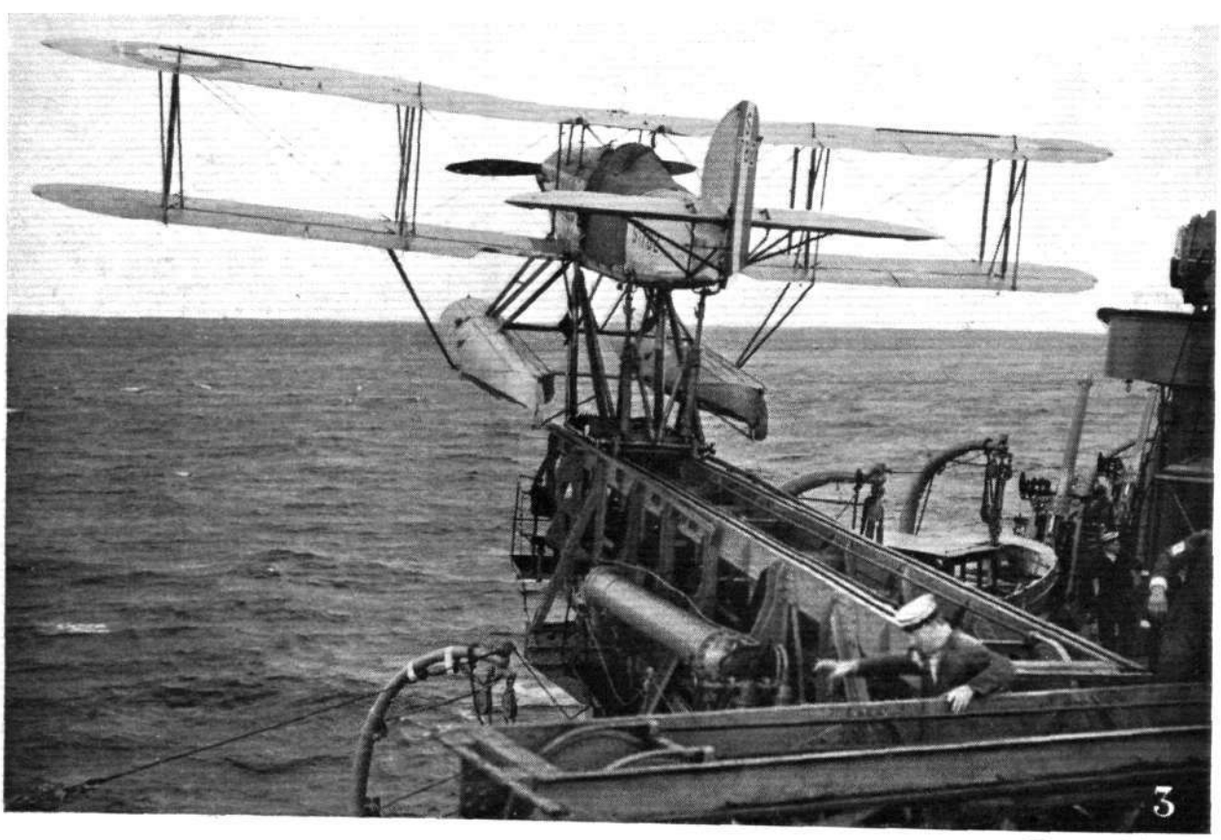
## Being an account of a visit paid to H.M.S. "Exeter" of the 2nd Cruiser Squadron, Home Fleet

FOLLOWING our policy of keeping our readers in touch with all phases of aviation, we are publishing, this week, a series of photographs taken by our staff photographer during a visit he paid recently to H.M.S. *Exeter*, of the 2nd Cruiser Squadron, Home Fleet, commanded by Capt. I. W. Gibson, R.N., at Invergordon. In FLIGHT for May 16, 1930, we gave a special supplement illustrating a visit to the aircraft carrier H.M.S. *Glorious*, and in the issue for July 31, 1931, were details of the equipment of the ill-fated submarine M.2, while on February 27, 1931, there was published an article on aircraft catapults of the type built by MacTaggart, Scott & Co. Reference should be made to this latter article, as space does not permit us republishing much of the matter it contained, but which is peculiarly apposite, as H.M.S. *Exeter* is one of the cruisers fitted with catapults manufactured by this firm.

Two of these launching devices are carried, and these are situated just abaft the after funnel and inclined at an angle of roughly 45 deg. to the fore and aft line of the ship. Our first photograph shows the Fairey IIIF. Fleet Spotter Reconnaissance aircraft (Napier "Lion") run back on the catapult and being prepared for flight. In No. 2 the aircraft is just leaving the trolley, which, it can be seen, has reached the extended forward portion of the catapult, at which point it is decelerated by the liquid-controlled




(FLIGHT *Photos.*)

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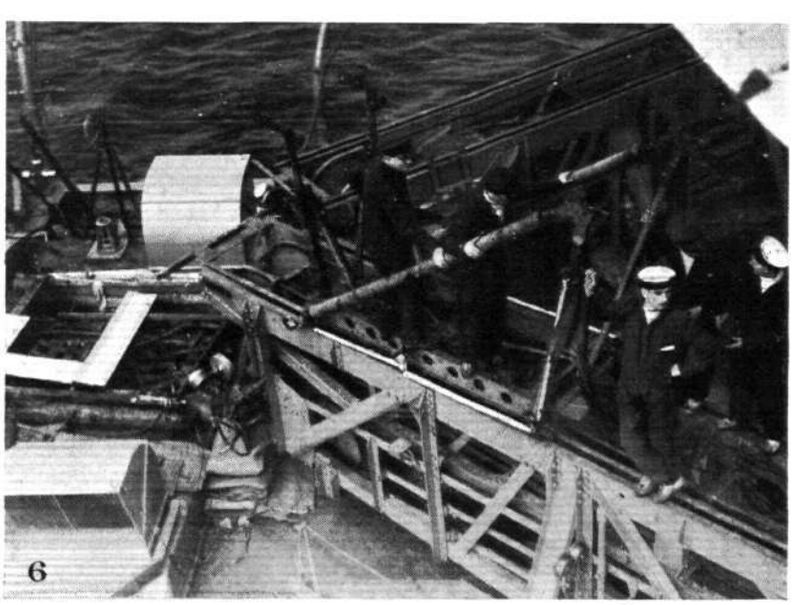
gives a very good idea of the difficult conditions under which these aircraft have to be maintained. Work on them must always be done in the open on platforms high above the water, and the greatest possible care has to be taken to guard against corrosion. For this purpose, of course, all parts subject to attack are continually greased with various special preparations, and those parts which can be, are covered up. It speaks well for the productions of the Fairey Co. that their IIIF.'s stand up to this work so well, for they are kept in service in ships like H.M.S. *Exeter* for a year at a time without complete overhaul, and the whole of this time they are maintained in an airworthy condition. The aircraft, of which one is carried for each catapult, are used for reconnaissance and spotting, according to the work upon which the ship is engaged. For example, one can well imagine circumstances, such as action against coastal towns, when the photographic equipment of the aircraft would be their most valuable feature. Back in harbour, our photographer was taken up in one of the IIIF.'s piloted by Lt. C. John, R.N., and was able to secure the following air photographs of some other ships of the Fleet. No. 8 is a fine view of H.M.S. *Exeter* herself, with H.M.S. *Norfolk* in the background. The other aircraft can be seen stowed on the port catapult, and abreast of

recoil ram. No. 3 is a rear view, showing the IIIF. in the stowed position ready for sea ; the special jury struts from the floats to the wings and between the ailerons and flaps should be noted ; these are fitted to prevent racking stresses when at sea. In No. 4 the starboard catapult is seen extended at each end, and the trolley is still right forward, where it was left after the aircraft had been launched ; just abaft the funnel can be seen the platform, which is mounted round the engine to enable work to be carried out on it at sea. In No. 5 the aircraft is not intentionally being maltreated, but merely being hooked on to the crane preparatory to being hoisted on board again ; the slings are secured either side of the top centre section. The view in No. 6 is that which is seen of the catapult from the aircraft as it is being slung on board ; the trolley is ready for taking the aircraft, and the catapult extensions have been run back. No. 7 is a view looking aft at the IIIF. on the port catapult, and it shows another cruiser, H.M.S. *Norfolk*, Capt. J. F. Somerville, R.N., also of the 2nd Cruiser Squadron, keeping station astern. A photograph like this



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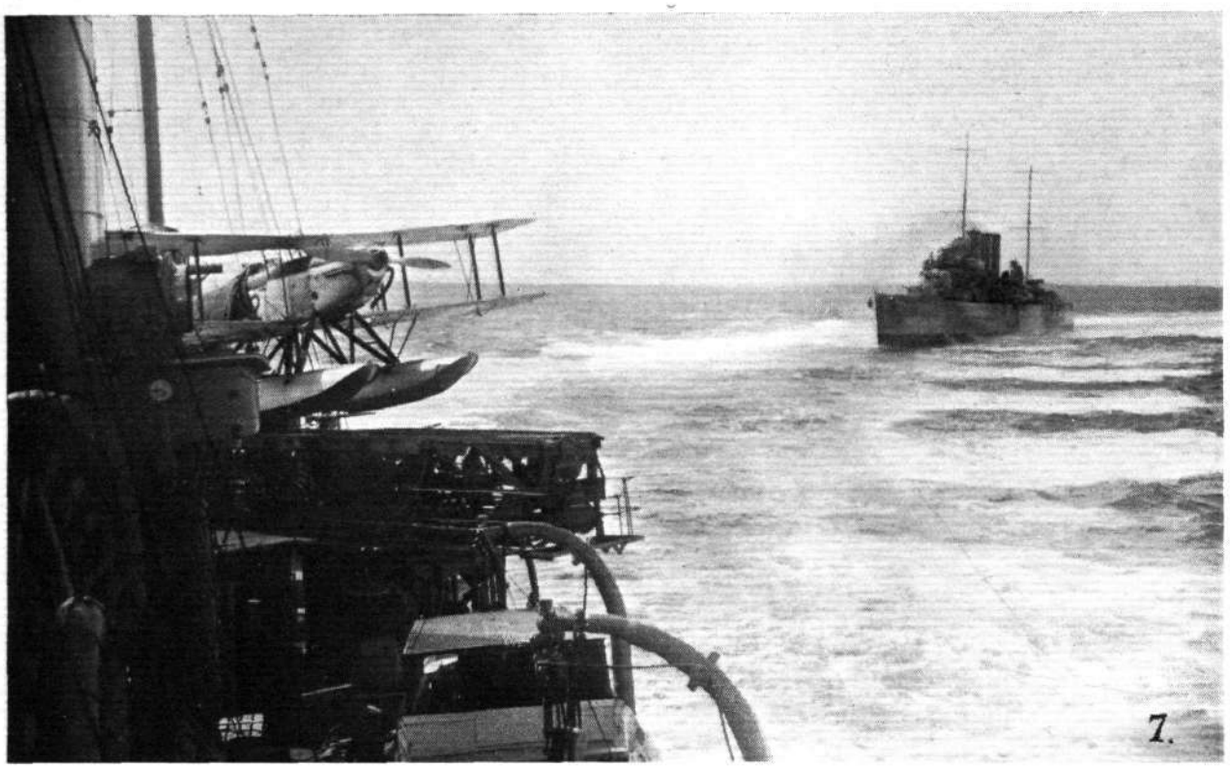
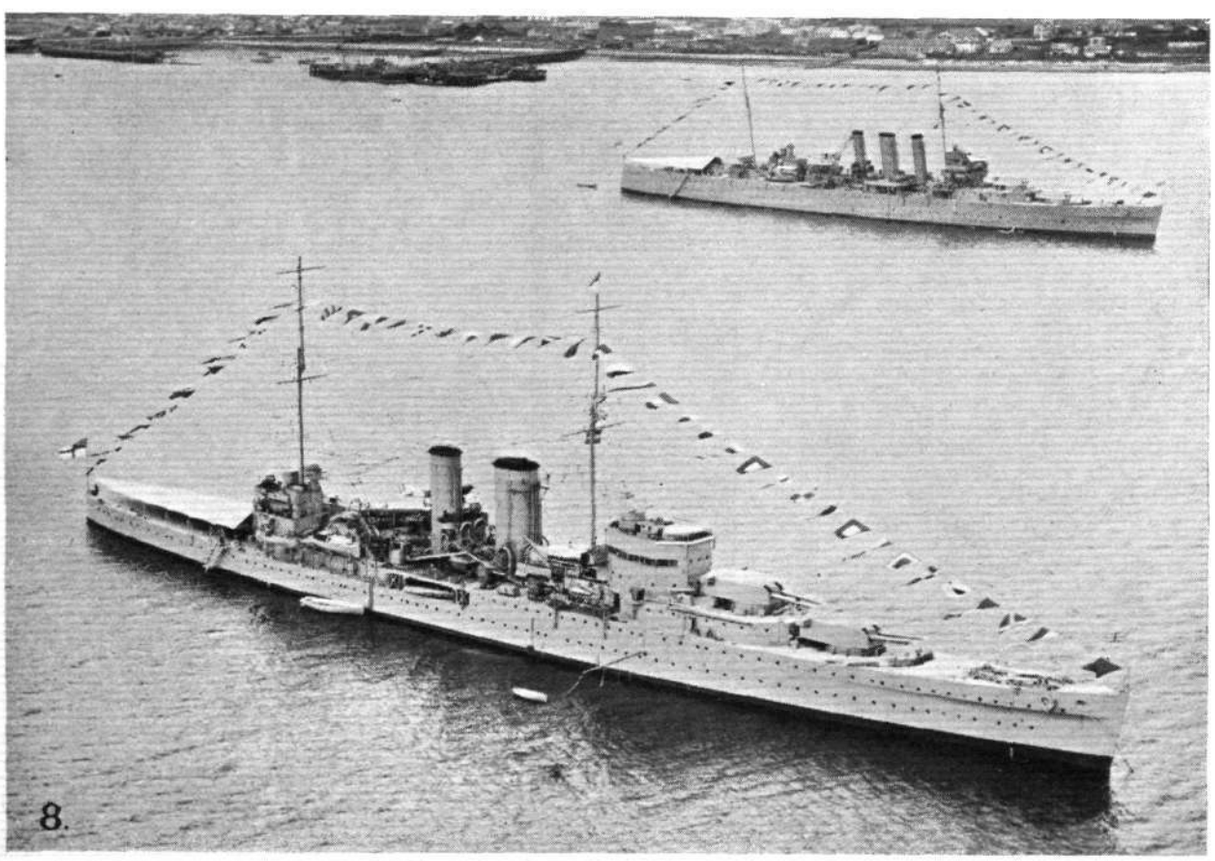
(FLIGHT *Photos.*)



7.

the funnels on the starboard side will be seen the crane—folded down—which is used to hoist the aircraft inboard. The after 8-in. gun turret is beneath the awning, and this, with the forward pair of turrets, comprises the main armament of this cruiser. Abreast the foremast are the 4-in. guns, which also form the anti-aircraft armament, while on the quarter-deck level, somewhat forward of the catapults, can be seen the torpedo tubes. Close examination of H.M.S. *Norfolk* will also disclose the fact that one of her aircraft has just been hoisted on board and stowed on the catapult, which is in roughly the same position as in H.M.S. *Exeter*. The next photograph, No. 9, is a view of H.M.S. *Nelson*, flagship of Admiral Sir John S. Kelly, Commander-in-Chief of the Home Fleet; with her heavy armament—nine 16-in. guns, twelve 6-in. and six 4.7-in. anti-aircraft guns—she is, with her sister ship, H.M.S. *Rodney*, probably the most formidable capital ship in the world. She carries the Fleet Aviation Officer to C. in C., Home Fleet, Wing Com. C. O. F. Modin, D.S.C., R.A.F., and is here seen lying off Invergordon.

Already known to our readers, H.M.S. *Furious*, Capt. C. F. S. Danbey, R.N., is the only aircraft carrier in the world with a clear flying deck extending over the whole ship. No. 10 shows this ship with her bridge, in the fore part of the upper flying deck, raised, and just abaft it are the screens for keeping the wind off the deck while



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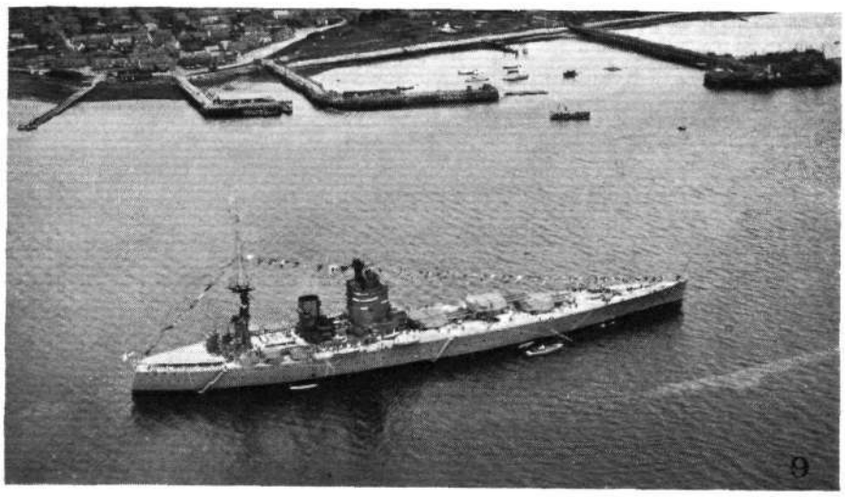
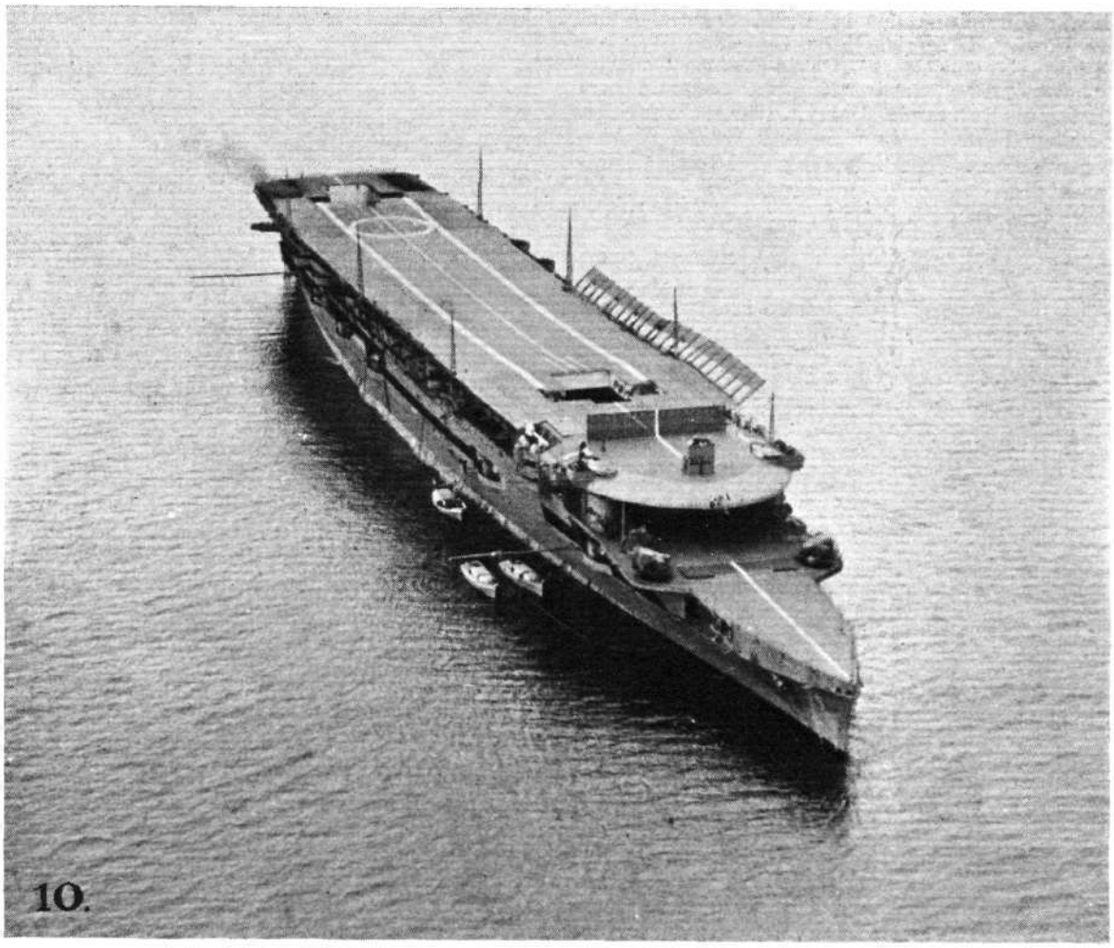
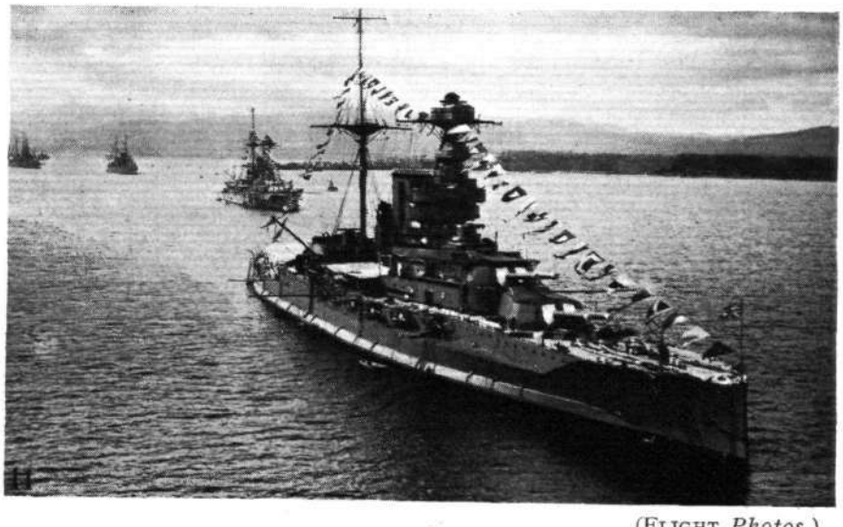
(FLIGHT *Photos.*)



be no reason why improvements should not be effected greatly increasing their sphere of usefulness. It stands to reason that, where operations are carried out near the coast, the aircraft can return, in bad weather, to some sheltered bay and land there, but the important point is that they will in all probability have been launched without interfering with the tactics of the Fleet in any way at all.



working on the aircraft. The curious smoke outlets from the boilers are seen at the after end, either side. Our last view, No. 11, is of H.M.S. *Malaya*, Capt. J. S. C. Salmond, R.N. This photograph was taken, as were the other aerial views, on the occasion of the King's Birthday, which is the reason why all the ships are "dressed." Her armament is eight 15-in. guns, twelve 6-in. and four 4-in. anti-aircraft. A sister ship carries a catapult on her quarter deck, with a Fairey IIIF. aircraft. The use of catapults in sea-going ships is as yet comparatively a venture, and their working is still very much in the experimental stage. That they are a valuable means of launching aircraft from ships not otherwise fitted for carrying aircraft is certain, and while at the present time the use of those aircraft is limited, due to their inability to land on rough water, yet there would appear to



(FLIGHT *Photos.*)

# THE ROYAL AERO CLUB OF THE UNITED KINGDOM

## OFFICIAL NOTICES TO MEMBERS

REPORT of the Meeting of the Committee of the Royal Aero Club held at 119, Piccadilly, W.1, on Wednesday, May 25, 1932, at 6.15 p.m.

*Present.*—Lord Gorell, C.B.E., M.C., in the Chair; Com. James Bird, O.B.E.; Maj. A. Goodfellow; Capt. A. G. Lamplugh; W. Lindsay Everard, M.P.; Col. F. Lindsay Lloyd, C.M.G., C.B.E.; J. Lord; Lt. Col. M. O'Gorman, C.B.; F. Handley Page, C.B.E.; Maj. H. A. Petre, D.S.O., M.C.; Capt. C. B. Wilson, M.C. In attendance, H. E. Perrin, Secretary; B. Stevenson, House Secretary.

**Election of Members.**—The following Members were elected:—Gerald Aubrey Alderson, Brian Seamer Allen, Henry Percy Bowler, Frederick John Cleveland, William Courtenay, Philip Kenyon George, David Watson Gourlay, Sir Robert Gower, M.P., Richard Humble, George Henry Keat, Nigel James Dalrymple Martyn, Ernst Schneider, Theodore Handley Stone, Howard Randall Brocas Waters.

**Aviators' Certificates.**—The following Aviators' Certificates were granted:—

AVIATORS' CERTIFICATES

| | | | |
|---|---|---|---|
| 10,452 | Karl Winkler | North Sea Aerial & General Transport, Ltd. | 20.4.32 |
| 10,453 | Donald Russell Robertson | | 21.4.32 |
| 10,454 | Richard Meredith Alcock | Wiltshire School of Fl. | 20.4.32 |
| 10,455 | Albert John Frampton | Hampshire Ae.C. | 22.4.32 |
| 10,456 | Richard Ward Thomas | Airwork School of Fl. | 24.4.32 |
| 10,457 | Charles Frederic Aston Beach | North Staffs (N.F.S.) | 23.4.32 |
| 10,458 | Ewart Clifford Kendall | Leicestershire Ae.C. | 22.4.32 |
| 10,459 | Patrick Bernard Swan | London Ae.C. | 25.4.32 |
| 10,460 | Robert John Waight | De Havilland School of Fl. | 25.4.32 |
| 10,461 | Ian Ross Sarel | Hanworth Club (N.F.S.) | 29.4.32 |
| 10,462 | John Casson | Hanworth Club (N.F.S.) | 29.4.32 |
| 10,463 | Alexander Paterson | British Air Transport, Ltd. | 29.4.32 |
| 10,464 | Stuart Lawrie | London Ae.C. | 29.4.32 |
| 10,465 | John Leslie Holmes | North Staffs Ae.C. (N.F.S.) | 28.4.32 |
| 10,466 | Charles Frederic Peach | North Staffs Ae.C. (N.F.S.) | 24.4.32 |
| 10,467 | Reginald Paul Thayre | Phillips & Powis (Reading) | 28.4.32 |
| 10,468 | Eric Moore Griffin | Surrey Fl. Services | 1.5.32 |
| 10,469 | Robert Christian Ramsay | Kent Fl.C. | 29.4.32 |
| 10,470 | Viscount Borodale | Airwork School of Fl. | 1.5.32 |
| 10,471 | Eric Lionel Gay | Herts & Essex Ae.C. | 2.5.32 |
| 10,472 | Richard Brian Ridley Martin | Wiltshire School of Fl. | 23.4.32 |
| 10,473 | Patrick Dunphy | Phillips & Powis (Reading) | 23.4.32 |
| 10,474 | Cyril John Baker | Hanworth (N.F.S.) | 10.5.32 |
| 10,475 | Ahmed Mohamed Mostafa | Phillips & Powis | 8.5.32 |
| 10,476 | Robert Thomas Boyd | Rollason Muir & Rickard | 7.5.32 |
| 10,477 | Richard Edgar Sharples | Blackpool & Fylde Ae.C. | 7.5.32 |
| 10,478 | Peter Hsueh Shih Chang | Phillips & Powis (Reading) | 1.5.32 |
| 10,479 | Kenneth Edward Lloyd | Bristol & Wessex Ae.C. | 10.5.32 |
| 10,480 | Royston George Newton | Bristol & Wessex Ae.C. | 10.5.32 |
| 10,481 | Arthur William Greaves | Kuala Lumpur Fl.C. | 16.4.32 |
| 10,482 | Leonard Frank Percy Walters | Herts & Essex Ae.C. | 12.5.32 |
| 10,483 | William Edmund Harker | Newcastle-on-Tyne Ae.C. | 30.3.32 |
| 10,485 | John Wynford George James | British Air Transport, Ltd. | 14.5.32 |
| 10,486 | Austin Voorsanger | Lancashire Ae.C. | 10.5.32 |
| 10,487 | Edward Gawin Downes-Martin | Wiltshire School of Fl. | 10.5.32 |

**Gliding Certificates.**—The following Gliding Certificates were granted:—

GLIDING CERTIFICATES

"A" CERTIFICATES

| | | | |
|---|---|---|---|
| 277 | See "B." | | |
| 278 | William Archer Forrest Bowen | London Gl.C. | 19.3.32 |
| 279 | Cecil Stanley Burney | London Gl.C. | 24.4.32 |
| 280 | Angus Melgund Murray | Borden Gl.C. | 12.4.32 |
| 281 | Albert E. C. York Bramble | Southern Counties Soaring | C.29.11.31 |
| 282 | Reginald Charles Rainey | Imperial College Gl.C. | 24.4.32 |
| 283 | Frank Gould Enser | Staines & District | 8.5.32 |
| 284 | Sydney John Cope | London Gl.C. | 8.5.32 |
| 285 | John Ferguson Harris | Ulster Gl. & Av.C. | 30.4.32 |
| 286 | Carl Alexander Beck | Ulster Gl. & Av.C. | 7.4.32 |
| 287 | Cuthbert Lewthwaite Startup | London Gl.C. | 15.5.32 |
| 288 | Richard Arthur Robbins | Imperial College Gl.C. | 15.5.32 |
| 289 | Norman Pringle Metcalfe | Ulster Gl. & Av.C. | 2.4.32 |

"B" CERTIFICATES

| | | | |
|---|---|---|---|
| 272 | John Grimston | London Gl.C. | 2.4.32 |
| 277 | Jacques Edouard Ledure | B.A.C. School of Auto-Towing | 9.3.32 |
| 278 | William Archer Forrest Bowen | London Gl.C. | 23.4.32 |
| 156 | Dennis Collinson Francis | Channel Gl.C. | 24.4.32 |
| 144 | George Konreid | Imperial College Gl.C. | 24.4.32 |
| 203 | Hubert Cecil Wynne | Ulster Gl. & Av.C. | 16.4.32 |
| 248 | Kathleen Isobella Mackie | Ulster Gl. & Av.C. | 7.5.32 |
| 249 | Percy Harold Baster | Ulster Gl. & Av. C. | 14.5.32 |
| 247 | Jack Pringle Mackie | Ulster Gl. & Av.C. | 14.5.32 |
| 289 | Norman Pringle Metcalfe | Ulster Gl. & Av.C. | 14.5.32 |

"C" CERTIFICATES

| | | | |
|---|---|---|---|
| 266 | Francis Brian Thomas | London Gl.C. | 23.4.32 |
| 250 | William Donald MacClement | London Gl.C. | 23.4.32 |
| 147 | John Bernard Everett Keeble | Imperial College Gl.C. | 23.4.32 |

**Sub-Committees.**—The Committee considered reports of the following Committees:—House Committee; Finance Committee; Racing Committee.

**Civil Aerodromes.**—It was decided to support the Memorandum prepared by the Civil Aviation Section of the London Chamber of Commerce on the subject of safeguarding of aerodrome sites.

**Portrait of Lord Wakefield.**—At the request of the Royal Aero Club, Lord Wakefield, one of the Vice-Presidents of the Club, has kindly consented to sit for his portrait, which will be hung in the Club. Capt. Oswald Birley has been commissioned by the Club to paint the portrait.

**Air Touring.**—The Royal Aero Club has under consideration a proposal to issue credit carnets for the supply of fuel to British air tourists while touring abroad. The proposal has received the approval of the F.A.I. and will come into operation very shortly.

# ARMORIAL BEARINGS AND THE AIR

AS far as we are aware, aeronautics have been introduced into armorial bearings for the first time in a coat of arms just designed by the College of Arms and officially granted to the Heston and Isleworth Urban District Council. These armorial bearings—shown in the illustration—are officially described as follows:—

"Tierce in Pairle Azure Sable and Gules in Chief Two Wings Conjoined in Base Argent, to the Dexter a Cross Bottonnée Or, and to the Sinister a Lion Rampant Guardant Per Fesse of the Last and of the Fourth, as the same are in the margin hereof more plainly depicted."

It is worth while noting that the lion was taken from the arms of Hounslow Priory, which was one of the first suppressed by Henry VIII, while the cross was taken from the


seal of the Monastery of St. Saviour and St. Brigit of Syon, the only English house of the Brigittine Order which was founded in 1415.

In view of these circumstances, it is rather pleasing to find that Heston has been given a pair of wings in recognition of the airport, and the approval of this coat of arms by the local authorities clearly shows the local attitude towards the airport—perhaps a rather striking instance of a point of view which may well be taken as an example to other districts. It is obvious, of course, that its air activities have put Heston on the map of Europe in a way that nothing else could have done, and it is to be hoped that traces of the original foundation of 1929 may survive as long in history as the traditions of these nice sounding old religious institutions have done.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

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June 17, 1932

CONTENTS



## THE ESTIMATION OF PROFILE DRAG.

By W. R. Andrews, A.F.R.Ae.S.

*In the following article Mr. W. R. Andrews, who is on the Technical Staff of A. V. Roe & Co., Ltd., Manchester, has analysed test data from the American Variable Density wind tunnel of the N.A.C.A., and has evolved certain empirical formulæ, which he has found to give a closer approximation than any hitherto employed. The generalisation of $k_{L\,max}$ may, the author admits, be subject to errors, and the presentation may be by no means accurate, but with the information available it was the best he could do, and the results appear to give a reliable guide to the full-scale characteristics of any practical aerofoil.*

Many attempts have been made to analyse Wind Tunnel Test data and produce generalised curves for drag prediction.

Most of these efforts have been based on tests carried out at low Reynolds Number, and have, as a consequence, been handicapped by scale effect. A method has been developed (Reference 1) using the test results of the original Variable Density Tunnel of the American N.A.C.A. This tunnel, as then constructed, had certain irregularities of flow, and has since been redesigned to overcome this difficulty. The effect of this irregular flow upon the no-lift characteristics of the tested aerofoils was discussed in a previous article (Reference 2).

It is inconceivable that irregularities can exist without affecting the drag, and particularly the value of the lift coefficient at minimum drag.

The tests on the three symmetrical aerofoils M.1, M.2 and M.3 (Reference 3) show that, as the thickness is increased, the minimum profile drag occurs at a more and more negative value of lift.

It is obvious that for a symmetrical section the no-lift and point of minimum drag must coincide, and inverting the model should show up any error due to asymmetry.

For certain cambered sections the minimum profile drag is also shown to occur at negative lift coefficient in these tests. This peculiarity of the original Variable Density Tunnel is partly responsible for the assumption made in Reference 1 that the minimum profile drag for all sections occurs at no-lift.

The tests made in the redesigned tunnel (References 4, 5, 6, 7 and 8) show very great consistency, not only in the matter of minimum drag, but also in the no-lift conditions.

The N.A.C.A. have designated the value of lift coefficient at minimum profile drag as the "Optimum." The same notation is used in this article, except that to comply with British notation $K_{L_{opt}}$ is used in place of $C_{L_{opt}}$.

It has been given by Glauert (Reference 9) that for an aerofoil having a centre line curved into the form of a circular arc the theoretical value of $K_{L_{opt}}$ is given by

$$K_{L_{opt}} = 2\pi\gamma \qquad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

where $\gamma$ = the maximum rise of the centre line in terms of the chord.

This, like all the theory so far developed, refers to very thin sections only.

The latest tests suggest that the thickness of the profile modifies this relationship.

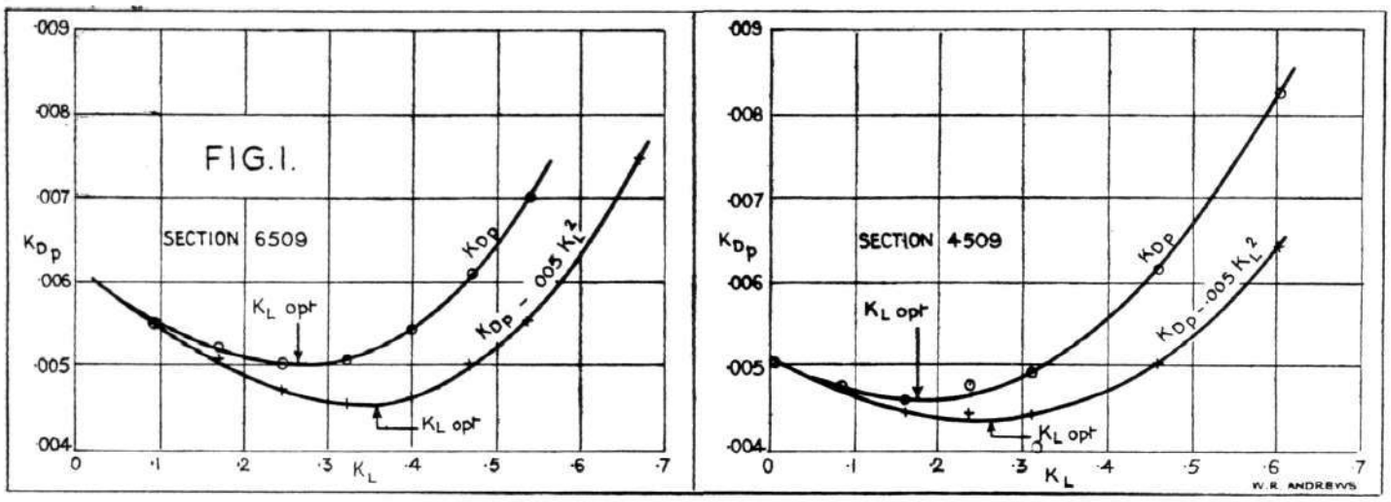
For aerofoils having the same centre line the value of $K_{L_{opt}}$ becomes smaller with increase in thickness.

For purpose of comparison, Fig. 2 is included giving the values of $K_{L_{opt}}$ for aerofoils discussed in R. & M. 946 and tested at atmospheric pressure.

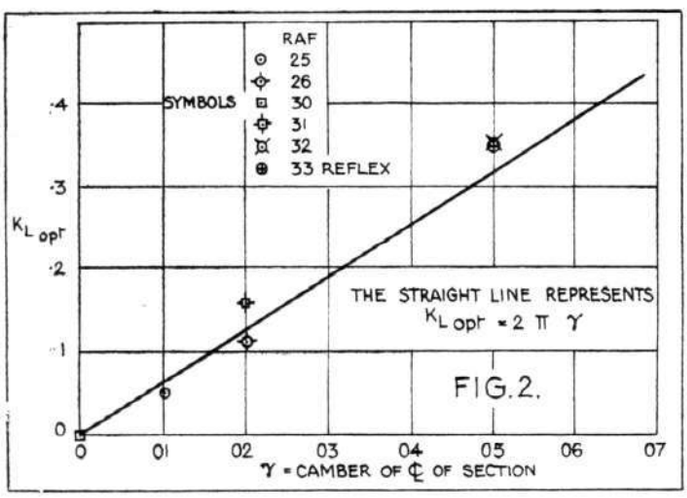
No indication is given here of any variation of $K_{L_{opt}}$ with thickness ratio, except perhaps to reverse that given by examination of the tests at full Reynolds Number.

There are not sufficient points to provide conclusive evidence either way.

It will be readily appreciated that the determination of the point of minimum profile drag by correction of tests at a finite aspect ratio is rather critical. A small change in the value of the induced drag coefficient and/or the wind tunnel wall constraint correction will appreciably affect $K_{L_{opt}}$. As an illustration, reference to Fig. 1 will show at once the variation in $K_{L_{opt}}$ for Sections 6509 and 4509 for an error of 0.005 $K^2_L$ in the




**Graph showing the effect on $k_{L_{opt}}$ of an error in the induced drag or wall constraint correction.**




**The Value of $k_{L_{opt}}$ for a few aerofoils tested in atmospheric wind tunnels.**

value of the induced drag figure and/or the constraint correction.

Such an error amounts to about 5 per cent. of the induced drag for aspect ratio 6.0, but would represent about 40 per cent. of the constraint correction.

It is not suggested that any modification is necessary of the method of obtaining profile drag at present employed. The illustration is only given to show how critical is the determination of the point of minimum profile drag.

The values of $K_{L_{opt}}$ for the systematic series tested by the N.A.C.A. given in the Technical Notes mentioned are as follow:—

TABLE I

| Section | $K_{L_{opt}}$ | Section | $K_{L_{opt}}$ |
|---|---|---|---|
| 4506 | 0·20 | 4306 | 0·20 |
| 4509 | 0·165 | 4309 | 0·16 |
| 4512 | 0·13 | 4312 | 0·12 |
| 4515 | 0·095 | 4315 | 0·08 |
| 4518 | 0·06 | 4318 | 0·04 |
| 4521 | 0·025 | 4321 | 0·0 |
| 6506 | 0·32 | 6306 | 0·35 |
| 6509 | 0·265 | 6309 | 0·29 |
| 6512 | 0·21 | 6312 | 0·23 |
| 6515 | 0·155 | 6315 | 0·17 |
| 6518 | 0·10 | 6318 | 0·11 |
| 6521 | 0·045 | 6321 | 0·05 |

The N.A.C.A. notation for the numbering of the Section is as follows:—

The first figure of its number represents the maximum rise of the centre line.

The second figure represents the fraction of the chord at which the camber of the centre line is greatest.

The last two figures represent the thickness to chord ratio—thus:

Camber = $\gamma$ = 4 per cent. at 0.5 chord and t/c ratio = 0.12.

then the Section is called 4512, and so on.

The method adopted for constructing the aerofoils is somewhat different from orthodox practice and needs explanation.

The profile is draped round a centre line by taking the ordinates normal to the centre line instead of normal to the chord line as is the more usual practice.

The leading edge of the aerofoil is then defined by the intersection of the tangent to the nose radius and the tangent to the centre line passing through the centre of L.E. radius (see Fig. 3).

This definition of an aerofoil is probably the correct one, but as this analysis is intended for application to aerofoils not so constructed, a transfer of datum now will save much labour when applying the results.

It is, therefore, proposed to use the definition of chord line as the line which passes through the centre of radii of leading and trailing edges.

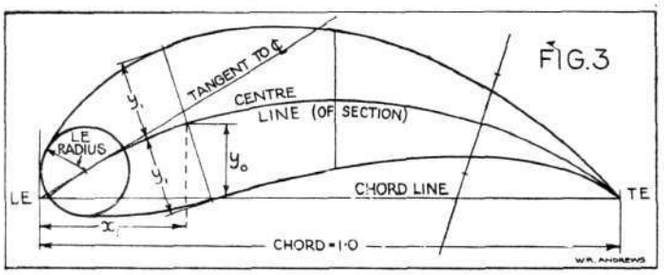
The following table gives the corrected figures for the cambers of the Sections on this basis:—

TABLE 2

| N.A.C.A. Section | Camber = | N.A.C.A. Section | Camber = |
|---|---|---|---|
| 4306 | 0·0393 | 4506 | 0·0396 |
| 4309 | 0·0383 | 4509 | 0·0393 |
| 4312 | 0·0371 | 4512 | 0·0387 |
| 4315 | 0·0351 | 4515 | 0·0380 |
| 4318 | 0·0331 | 4518 | 0·0371 |
| 4321 | 0·0301 | 4521 | 0·0359 |
| 6306 | 0·0589 | 6506 | 0·0595 |
| 6309 | 0·0576 | 6509 | 0·0589 |
| 6312 | 0·0555 | 6512 | 0·0581 |
| 6315 | 0·0529 | 6515 | 0·0569 |
| 6318 | 0·0496 | 6518 | 0·0555 |
| 6321 | 0·0458 | 6521 | 0·0539 |

The values of $K_{L_{opt}}$ have been plotted against the respective value of camber in Figs. 4 and 5.

The straight lines drawn through the points of equal thickness ratio do not intersect at the zero.




**The N.A.C.A. Method of construction for 43, 63, 45, and 65 series of aerofoils.**

Considering how critical $K_{L_{opt}}$ is, this is perhaps not surprising.

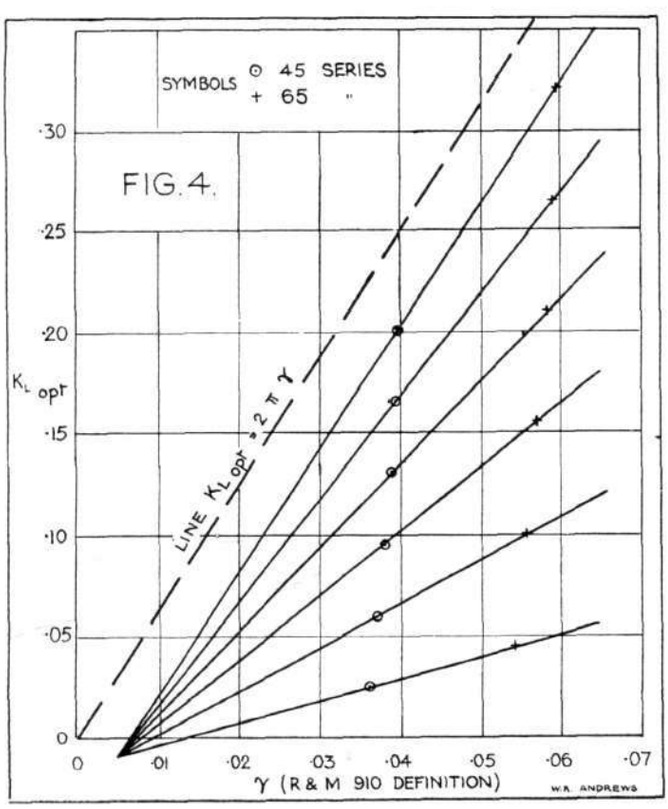
A reduction of profile drag of approximately $0.002K_L^2$ would bring the point of intersection for sections with maximum camber at 0.5 c. to a little above zero, but the other Series would still have a negative value for $K_{L_{opt}}$ at zero camber.

It must be left to the discretion of the Operator whether or not the curves can be moved bodily until $K_{L_{opt}}$ at $\gamma = 0$ is zero.

The law for $K_{L_{opt}}$ can be expressed as follows:—

$$K_{L_{opt}} = (\gamma + K)(A - Bt) - D \quad \ldots\ldots \quad (2)$$

| | Max. Camber at | |
|---|---|---|
| | 0·3° C. | 0·5° C. |
| Where K = .... .... | 0·0 | 0·005 |
| ,, A = .... .... | 9·37 | 7·94 |
| ,, B = .... .... | 28·7 | 33·9 |
| ,, D = .... .... | 0·10 | 0·01 |




**Values of $k_L$ at minimum profile drag.**

**Minimum Profile Drag.**

The next consideration is the value of minimum profile drag.

This has already been expressed empirically by the N.A.C.A. in the Technical Notes mentioned.

The generalised result expressed in British notation is as follows:—

$$K_{D_p}\ \text{min} = 0.00325 + 0.00415\,t + 0.0486\,t^2 + k \quad \ldots \quad (3)$$

Where $k$ = 0 for Symmetrical Section.
= 0.0007 for 45 Series.
= 0.0010 to 0.00145 for 65 Series.
= 0.00045 for 43 Series.
= 0.0010 for 63 Series.

A good average for $k$ is

$$k = 0.33\,\gamma^2 \quad \ldots\ldots \quad (4)$$

Substituting this in 3 gives the final equation for minimum profile drag as

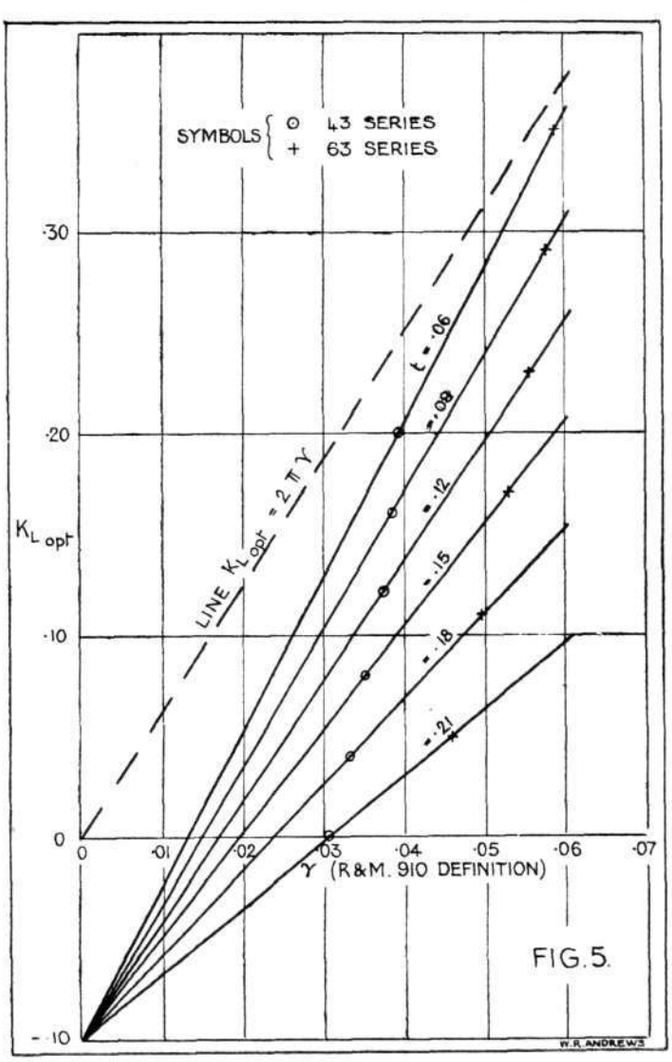
$$K_{D_p}\ \text{min} = 0.00325 + 0.00415\,t + 0.0486\,t^2 + 0.33\,\gamma^2 \quad \ldots (5)$$

The " extra " profile drag at values of lift greater or lesser than $K_{L_{opt}}$ has now to be determined.

It is suggested in the N.A.C.A. Technical Notes that this additional drag should take the form

$$\Delta\ K_{D_p} = x\,(K_L - K_{L_{opt}})^2 \quad \ldots\ldots \quad (6)$$

This relationship does not give too good agreement except at values of $K_L$ close to $K_{L_{opt}}$ and is only suggested to facilitate performance calculations.




**Values of $k_L$ at minimum profile drag.**

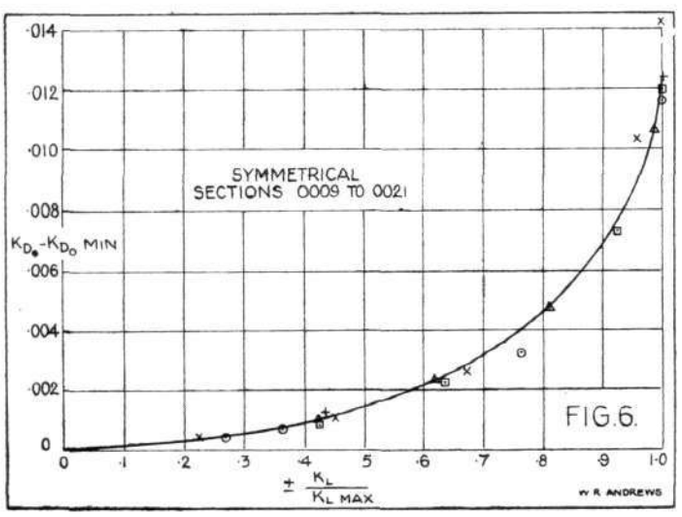
A much better agreement seems possible by expressing the " extra " drag as

$$\Delta K_{D_p} = f\left(\frac{K_L - K_{L_{opt}}}{K_{L_{max}} - K_{L_{opt}}}\right) \quad \ldots\ldots\ldots\ldots\ldots \quad (7)$$

The results using this procedure are shown in Figs. 6 and 7.

Very close agreement is obtained for the Symmetrical Sections, but here the thinnest section No. 0006 is not included, as in this instance the drag rose rapidly preceding the stall.

As such a thin symmetrical section is probably only of interest for completing the series tested, there is no loss of generality by neglecting this result.




**" Extra " profile drag curves.**

Referring to Fig. 7 it will be noticed that there is no change in $\Delta K_{D_p}$ with camber for the 43 and 63 Series. The two sets of results lie on the same curve.

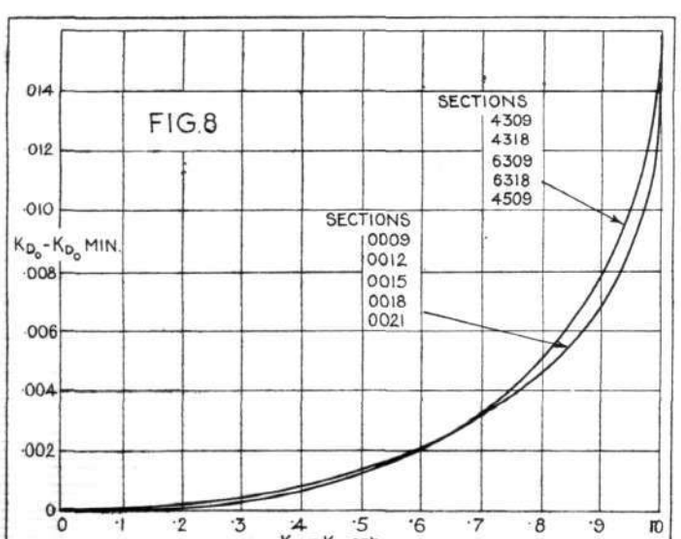
This is not so with the 45 and 65 Series.

Here only Section 4509 agrees with the results obtained from the 43 and 63 Series.

Why the sections having the maximum camber at 0.5 of the chord should show this marked increase in " extra " profile drag with increasing thickness and camber is not apparent.

It is conceivable that the minimum value for this " extra " drag is given by the symmetrical aerofoils.

Those sections having their maximum camber at 0.3 of the chord have an " extra " profile drag curve almost identical with that of the Symmetrical Sections as shown by Fig. 8.



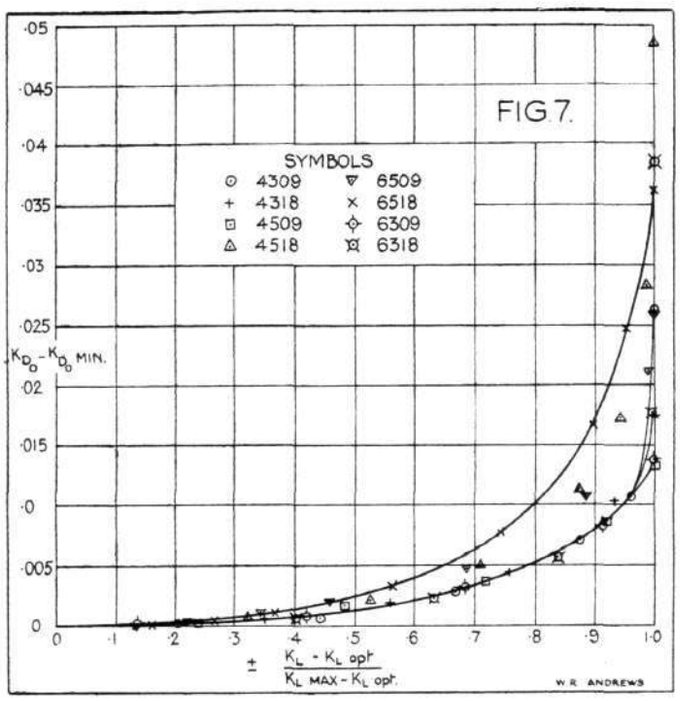

**Meaned " Extra " profile drag curves.**

With constant camber and increasing thickness, or constant thickness and increasing camber, some combination of camber and thickness is reached above which this " extra " drag breaks away from the minimum given by the Symmetrical Sections.

The present tests indicate that for sections having the maximum camber at 0.5 c. the point is reached earlier than with sections having the maximum at 0.3 c.

So far as these tests go, they suggest that for most practical aerofoils with maximum camber at 0.3 c. there is no breakaway of the " extra " drag from the minimum.

This does not mean that the sections with the maximum camber at 0.3 c. are more efficient than those with the maximum at 0.5, since the maximum lift of the latter is generally greater than that of the former.




The tests are not sufficiently comprehensive to give the exact combination of camber and thickness at which the breakaway of the " extra " drag occurs.

As, however, the majority of aerofoils have their maximum camber at 0.3 of the chord or thereabouts, the minimum value for the " extra " drag will apply in most cases and will be at the most only a few per cent. out at climbing speed for the worst cases.

At top speed the effect of the " extra " drag is not appreciable, and the accuracy of the profile drag at this point is almost wholly dependent upon the estimated minimum profile drag.

Fig. 8 may then be used for obtaining the drag curve between $K_{L_{opt}}$ and $K_{L_{max}}$ for all practical aerofoils.

Once the maximum lift coefficient has been determined, the drag curve can be completely defined.

*(To be concluded)*

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## TORSION CALCULATIONS FOR A REAR FUSELAGE WITH TWO OR MORE "UNKNOWNS."

By H. DAVIES, B.A., A.F.R.Ae.S.

*Certain difficulties are encountered when an attempt is made to solve a rear fuselage for torsion, with two or more "unknown" forces at the stern end. In the following article Mr. Davies, who is on the Technical Staff of Handley Page, Ltd., outlines a simple method of overcoming the difficulties.*

TORSION calculations for a rear fuselage structure, with two or more "unknown" reactions, are found to give rise to certain difficulties, which will be explained in detail below. The present article aims at presenting a simple method of overcoming these difficulties.

As an illustration of the proposed method of treatment, consider the fuselage shown below (Fig. 1). The fin and rudder are assumed to carry a factored side load of 2,400 lb. The diagrams show the dimensions of the rear fuselage structure, the size of the members, the relative position of the side load, and details of the two "unknowns." (It should be emphasised that the diagrams are imaginary, and refer to no particular aircraft.)

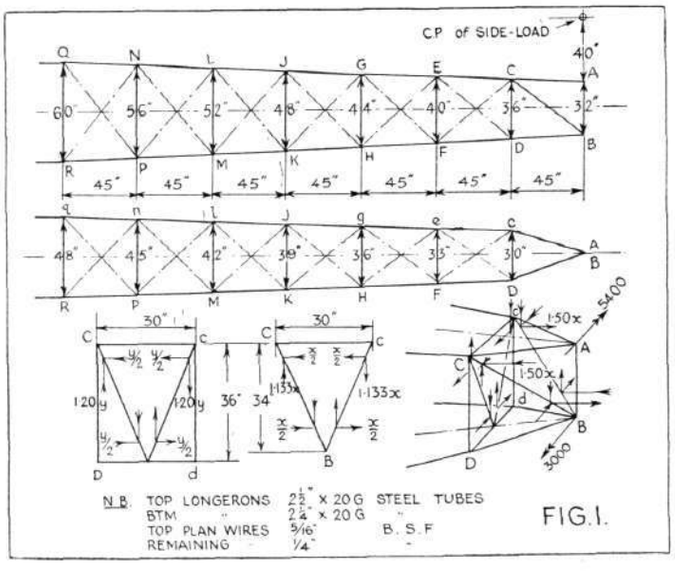


FIG.1.

"Unknown" reactions have been assumed to act in the diagonal struts CB, cB, and in bulkhead C*cd*D. A total transverse force $x$ is assumed to act in CB*c*, and a total transverse force $y$ in bulkhead C*cd*D.

The conventional method of treating the structure is to determine the load P in any member of the fuselage in terms of the two unknown reactions, as follows:—

$$P = \alpha x + \beta y + \gamma$$

where $\alpha$, $\beta$ and $\gamma$ are constants.

Then with the usual notation:

$$\text{Resilience, } U = \Sigma\left\{\frac{P^2 l}{2AE}\right\}$$

Differentiating, with respect to the two unknown reactions, $x$ and $y$, we have:—

$$\frac{\partial U}{\partial x} = 0 = \Sigma\left\{\frac{l}{AE} \times P \times \frac{\partial P}{\partial x}\right\}$$

$$= \Sigma\left\{\frac{l}{AE} \times \alpha \times P\right\}$$

$$= \Sigma\left\{\frac{l}{AE} \times \alpha \times (\alpha x + \beta y + \gamma)\right\} \quad \ldots\ldots 1$$

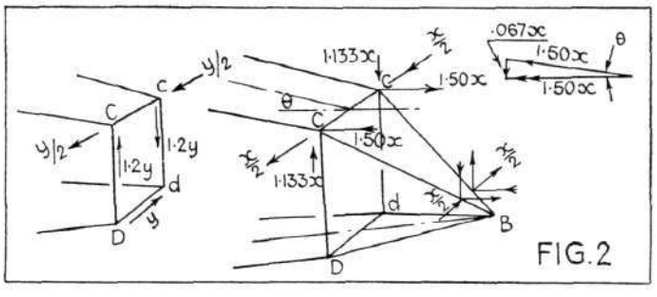
and similarly

$$\frac{\partial U}{\partial y} = 0 = \Sigma\left\{\frac{l}{AE} \times \beta \times (\alpha x + \beta y + \gamma)\right\} \quad \ldots\ldots 2$$

The difficulty most commonly experienced in practice is that summation of the terms (1) and (2) leads to two simultaneous equations that are *practically identical*, and therefore almost insoluble. The reason for this will be made clearer by referring to Table 5, which shows a specimen of the strain energy calculations, carried out in the orthodox manner. The table applies to the aircraft under consideration, and gives the strain energy figures for the top longerons in terms of the two unknowns, $x$ and $y$. It will be noticed that all the terms in $x$ and $y$ are comparable in magnitude, and that they are nearly equal at the forward end of the fuselage, where they have the greatest effect on the final calculations. This, of course, is inevitable, whenever the loads throughout the rear fuselages are expressed in terms of two similar and adjacent "unknowns" at the stern end. This point will be referred to again later.

Various methods have been proposed for overcoming this difficulty. The method suggested below is believed to be new. It has the advantage of simplicity, and it involves no additional labour of any kind in the course of the calculations.

Consider the rear fuselage wedge, AB C*cd*D. The following diagram (Fig. 2) shows the load system in terms of the two unknown reactions $x$ and $y$.




It will be found more convenient to apply the end-couple at C, $c$ (*i.e.*, $1.50x$) in the plane of the *top plane truss*, instead of in a true horizontal plane. This leads to the following system of reactions. (Fig. 3.)

The proposed method of treatment is simply to replace the variables $x$ and $y$ by $x$ and $u$, where $x + y = u$.

Then $1.0667x + 1.20y = 1.20u - 0.1333x$. Fig. 4, below, shows the load system supplied to bulkhead C*cd*D in terms of the two new unknowns, $x$ and $u$.

In the proposed method of treatment, *the load* P *in any member of the fuselage, is found directly in terms of the unknowns*, $x$ and $u$.

Thus:

$$P = ax + bu + c$$

where $a$, $b$ and $c$ are constants.

Then with the usual notation

$$\frac{dU}{dx} = 0 = \Sigma\left\{\frac{l}{AE} \times a \times (ax + bu + c)\right\}$$

$$\frac{dU}{du} = 0 = \Sigma\left\{\frac{l}{AE} \times b \times (ax + bu + c)\right\}$$

As explained above, the method now consists in determining the load in every member of the fuselage structure directly in terms of $x$ and $u$, and in carrying out the normal strain energy calculations in terms of these variables. The resultant load system to be applied to the plan and side trusses of the fuselage is indicated in Fig. 5 below. (In every case the loads shown are *in the plane* of the truss concerned.)

The following tables give the strain energy calculations for the longerons and wires of the rear fuselage structure. The contents of the tables are as follow:—

Table I. Summary of longeron loads in terms of $x$ and $u$.

Table II. Strain energy calculations for top longerons in terms of $x$ and $u$.

Table III. Strain energy calculations for bottom longerons.

Table IV. Strain energy calculations for wires.

Table V. Specimen of strain energy calculations for the top longerons *only*, in terms of $x$ and $y$.

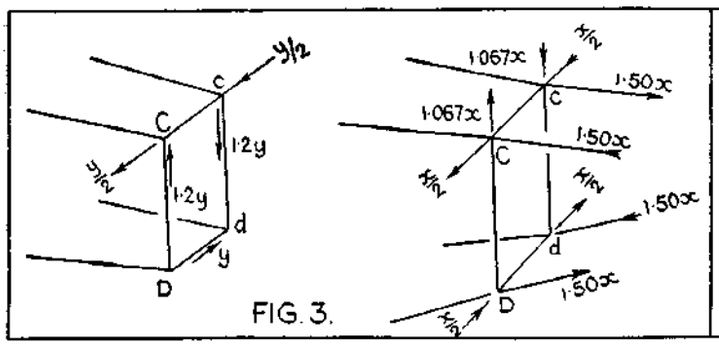



TABLE 2

*Strain Energy Calculations for Top Longerons, in terms of "x" and "u"*

| Member | $l$ in. | A sq. in. | Load, P = $ax + bu + c$: $a$ | $b$ | $c$ | $\pm \frac{l}{A} \times a$ | $\frac{l}{A} \times a \times (ax + bu + c)$ | $\pm \frac{l}{A} \times b$ | $\frac{l}{A} \times b \times (ax + bu + c)$ |
|---|---|---|---|---|---|---|---|---|---|
| *Port* | | | | | | | | | |
| CE .... | 45 | 0·279 | 1·35 | 1·35 | − 8,100 | 217 | 293x + 290u − 1·76×10⁶ | 217 | 290x + 290u − 1·8×10⁶ |
| EG .... | 45 | 0·279 | 1·10 | 3·80 | −14,750 | 177 | 195x + 670u − 2·61×10⁶ | 612 | 670x + 2,320u − 9·0×10⁶ |
| GJ .... | 45 | 0·279 | 0·88 | 5·89 | −20,250 | 141 | 124x + 840u − 2·85×10⁶ | 950 | 840x + 5,590u − 19·2×10⁶ |
| JL .... | 45 | 0·279 | 0·69 | 7·62 | −24,850 | 111 | 77x + 850u − 2·75×10⁶ | 1227 | 850x + 9,360u − 30·4×10⁶ |
| LN .... | 45 | 0·279 | 0·54 | 9·11 | −28,900 | 87 | 47x + 790u − 2·51×10⁶ | 1465 | 790x + 13,350u − 42·4×10⁶ |
| NQ .... | 45 | 0·279 | 0·40 | 10·40 | −32,500 | 64 | 26x + 670u − 2·08×10⁶ | 1675 | 670x + 17,420u − 54·5×10⁶ |
| *Stbd.* | | | | | | | | | |
| *ce* .... | 45 | 0·279 | −1·365 | − 1·35 | 14,750 | 220 | 300x + 300u − 3·24×10⁶ | 217 | 300x + 290u − 3·2×10⁶ |
| *eg* .... | 45 | 0·279 | −1·10 | − 3·86 | 20,250 | 177 | 195x + 680u − 3·59×10⁶ | 622 | 680x + 2,410u − 12·6×10⁶ |
| *gj* .... | 45 | 0·279 | −0·88 | − 5·91 | 24,800 | 141 | 124x + 840u − 3·50×10⁶ | 954 | 840x + 5,640u − 23·6×10⁶ |
| *jl* .... | 45 | 0·279 | −0·69 | − 7·67 | 28,900 | 111 | 77x + 850u − 3·21×10⁶ | 1235 | 850x + 9,490u − 35·8×10⁶ |
| *ln* .... | 45 | 0·279 | −0·54 | − 9·16 | 32,500 | 87 | 47x + 800u − 2·83×10⁶ | 1475 | 800x + 13,500u − 48·0×10⁶ |
| *nq* .... | 45 | 0·279 | −0·40 | −10·45 | 35,500 | 64 | 26x + 670u − 2·27×10⁶ | 1685 | 670x + 17,620u − 59·9×10⁶ |
| | | | | | | $\Sigma =$ | 1,531x + 8,250u − 33·20×10⁶ | $\Sigma =$ | 8,250x + 97,280u − 340·4×10⁶ |

TABLE 3

*Strain Energy Calculations for Bottom Longerons*

| Member | $l$ in. | A sq.in. | Load = $ax + bu + c$: $a$ | $b$ | $c$ | $\pm \frac{l}{A} \times a$ | $\frac{l}{A} \times a \times (ax + bu + c)$ | $\pm \frac{l}{A} \times b$ | $\frac{l}{A} \times b \times (ax + bu + c)$ |
|---|---|---|---|---|---|---|---|---|---|
| *Port* | | | | | | | | | |
| DF .... | 45 | 0·250 | −1·365 | − 1·35 | 8,200 | 246 | 337x + 330u − 2·02×10⁶ | 243 | 330x + 330u − 2·0×10⁶ |
| FH .... | 45 | 0·250 | −1·10 | − 3·86 | 11,250 | 198 | 218x + 770u − 2·23×10⁶ | 695 | 770x + 2,690u − 7·8×10⁶ |
| HK .... | 45 | 0·250 | −0·88 | − 5·91 | 13,850 | 158 | 139x + 940u − 2·19×10⁶ | 1063 | 940x + 6,300u − 14·7×10⁶ |
| KM .... | 45 | 0·250 | −0·69 | − 7·67 | 16,050 | 124 | 86x + 950u − 1·99×10⁶ | 1380 | 950x + 10,600u − 22·2×10⁶ |
| MP .... | 45 | 0·250 | −0·54 | − 9·16 | 18,050 | 97 | 52x + 890u − 1·75×10⁶ | 1650 | 890x + 15,130u − 29·8×10⁶ |
| PR .... | 45 | 0·250 | −0·40 | −10·45 | 19,700 | 72 | 29x + 750u − 1·42×10⁶ | 1880 | 750x + 19,650u − 37·1×10⁶ |
| *Stbd.* | | | | | | | | | |
| *df* .... | 45 | 0·250 | 1·35 | 1·35 | − 4,500 | 243 | 330x + 330u − 1·10×10⁶ | 243 | 330x + 330u − 1·1×10⁶ |
| *fh* .... | 45 | 0·250 | 1·10 | 3·80 | − 8,200 | 198 | 218x + 750u − 1·62×10⁶ | 685 | 750x + 2,600u − 5·6×10⁶ |
| *hk* .... | 45 | 0·250 | 0·88 | 5·89 | −11,250 | 158 | 139x + 430u − 1·78×10⁶ | 1060 | 930x + 6,250u − 11·9×10⁶ |
| *km* .... | 45 | 0·250 | 0·69 | 7·62 | −13,850 | 124 | 86x + 950u − 1·72×10⁶ | 1370 | 950x + 10,450u − 19·0×10⁶ |
| *mp* .... | 45 | 0·250 | 0·54 | 9·11 | −16,050 | 97 | 52x + 880u − 1·56×10⁶ | 1640 | 880x + 14,930u − 26·3×10⁶ |
| *pr* .... | 45 | 0·250 | 0·40 | 10·40 | −18,050 | 72 | 29x + 750u − 1·30×10⁶ | 1870 | 750x + 19,450u − 33·8×10⁶ |
| | | | | | | $\Sigma =$ | 1,715x + 9,220u − 20·66×10⁶ | $\Sigma =$ | 9,220x + 108,710u − 211·3×10⁶ |

TABLE 4

*Strain Energy Calculations for Wires*

| Member | $l$ in. | A sq. in. | Load $= ax + bu + c$ $a$ | $b$ | $c$ | $\pm \frac{l}{A} \times a$ | $\frac{l}{A} \times a \times (ax + bu + c)$ | $\pm \frac{l}{A} \times b$ | $\frac{l}{A} \times b \times (ax + bu + c)$ |
|---|---|---|---|---|---|---|---|---|---|
| *Top* | | | | | | | | | |
| cE .... | 55 | 0·0391 | −0·165 | 1·65 | −8,100 | 232 | $38x - 380u + 1{\cdot}88 \times 10^6$ | 2320 | $-380x + 3{,}840u - 18{\cdot}8 \times 10^6$ |
| eG .... | 57 | 0·0391 | −0·133 | 1·44 | −6,950 | 194 | $26x - 280u + 1{\cdot}35 \times 10^6$ | 2100 | $-280x + 3{,}020u - 14{\cdot}6 \times 10^6$ |
| gJ .... | 59 | 0·0391 | −0·125 | 1·24 | −6,050 | 188 | $23x - 230u + 1{\cdot}14 \times 10^6$ | 1870 | $-230x + 2{,}320u - 11{\cdot}3 \times 10^6$ |
| jL .... | 61 | 0·0391 | −0·111 | 1·10 | −5,400 | 173 | $19x - 190u + 0{\cdot}94 \times 10^6$ | 1715 | $-190x + 1{,}880u - 9{\cdot}3 \times 10^6$ |
| lN .... | 63 | 0·0391 | −0·096 | 0·98 | −4,850 | 154 | $15x - 150u + 0{\cdot}75 \times 10^6$ | 1580 | $-150x + 1{,}550u - 7{\cdot}7 \times 10^6$ |
| nQ .... | 65 | 0·0391 | −0·090 | 0·89 | −4,320 | 150 | $13x - 130u + 0{\cdot}65\ 10^6$ | 1480 | $-130x + 1{,}320u - 6{\cdot}4 \times 10^6$ |
| *BTM* | | | | | | | | | |
| Df .... | 55 | 0·023 | −0·165 | 1·65 | −4,500 | 394 | $65x - 650u + 1{\cdot}78 \times 10^6$ | 3940 | $-650x + 6{,}500u - 17{\cdot}8 \times 10^6$ |
| Fk .... | 57 | 0·023 | −0·133 | 1·44 | −3,850 | 330 | $43x - 470u + 1{\cdot}27 \times 10^6$ | 3570 | $-470x + 5{,}130u - 13{\cdot}8 \times 10^6$ |
| Hk .... | 59 | 0·023 | −0·125 | 1·24 | −3,370 | 320 | $40x - 400u + 1{\cdot}07 \times 10^6$ | 3180 | $-400x + 3{,}950u - 10{\cdot}7 \times 10^6$ |
| Km .... | 61 | 0·023 | −0·111 | 1·10 | −3,000 | 294 | $32x - 320u + 0{\cdot}88 \times 10^6$ | 2920 | $-320x + 3{,}210u - 8{\cdot}8 \times 10^6$ |
| Mp .... | 63 | 0·023 | −0·096 | 0·98 | −2,700 | 262 | $26x - 260u + 0{\cdot}71 \times 10^6$ | 2680 | $-260x + 2{,}630u - 7{\cdot}2 \times 10^6$ |
| Pr .... | 65 | 0·023 | −0·090 | 0·89 | −2,400 | 255 | $23x - 230u + 0{\cdot}61 \times 10^6$ | 2520 | $-230x + 2{,}240u - 6{\cdot}0 \times 10^6$ |
| | | | | | | $\Sigma =$ | $363x - 3{,}690u + 13{\cdot}05 \times 10^6$ | $\Sigma =$ | $-3{,}690x + 37{,}590u - 132{\cdot}4 \times 10^6$ |
| *Port* | | | | | | | | | |
| CF .... | 59 | 0·023 | 0·196 | −1·765 | — | 502 | $99x - 890u$ | 4520 | $-890x + 8{,}000u$ |
| EH .... | 62 | 0·023 | 0·168 | −1·51 | — | 453 | $76x - 680u$ | 4070 | $-680x + 6{,}120u$ |
| GK .... | 64 | 0·023 | 0·146 | −1·315 | — | 406 | $59x - 530u$ | 3660 | $-530x + 4{,}800u$ |
| JM .... | 67 | 0·023 | 0·129 | −1·16 | — | 378 | $49x - 440u$ | 3380 | $-440x + 3{,}920u$ |
| LP .... | 70 | 0·023 | 0·115 | −1·04 | — | 350 | $40x - 360u$ | 3160 | $-360x + 3{,}290u$ |
| NR .... | 73 | 0·023 | 0·104 | −0·94 | — | 330 | $34x - 310u$ | 2980 | $-310x + 2{,}800u$ |
| | | | | | | $\Sigma =$ | $357x - 3{,}210u$ | $\Sigma =$ | $-3{,}210x + 28{,}930u$ |
| | | | | | | $2 \times \Sigma =$ | $714x - 6{,}420u$ | $2 \times \Sigma =$ | $-6{,}420 + 57{,}860u$ |

TABLE 5

*Specimen of Strain Energy Calculations for Top Longerons in Terms of "x" and "y"*

| Member | $l$ in. | A sq. in. | Load, $P = \alpha x + \beta y + \gamma$ $\alpha$ | $\beta$ | $\gamma$ | $\pm \frac{l}{A} \times \alpha$ | $\frac{l}{A} \times \alpha \times (\alpha x + \beta y + \gamma)$ | $\pm \frac{l}{A} \times \beta$ | $\frac{l}{A} \times \beta \times (\alpha x + \beta y + \gamma)$ |
|---|---|---|---|---|---|---|---|---|---|
| *Port* | | | | | | | | | |
| CE .... | 45 | 0·279 | 2·70 | 1·35 | − 8,100 | 434 | $1{,}170x + 580y - 3{\cdot}5 \times 10^6$ | 217 | $580x + 290y - 1{\cdot}8 \times 10^6$ |
| EG .... | 45 | 0·279 | 4·90 | 3·80 | −14,750 | 789 | $3{,}870x + 3{,}000y - 11{\cdot}6 \times 10^6$ | 612 | $3{,}000x + 2{,}320y - 9{\cdot}0 \times 10^6$ |
| GJ .... | 45 | 0·279 | 6·77 | 5·89 | −20,250 | 1091 | $7{,}400x + 6{,}430y - 22{\cdot}1 \times 10^6$ | 950 | $6{,}430x + 5{,}590y - 19{\cdot}2 \times 10^6$ |
| JL .... | 45 | 0·279 | 8·41 | 7·62 | −24,850 | 1348 | $11{,}350x + 10{,}300y - 33{\cdot}6 \times 10^6$ | 1227 | $10{,}300x + 9{,}360y - 30{\cdot}4 \times 10^6$ |
| LN .... | 45 | 0·279 | 9·65 | 9·11 | −28,900 | 1552 | $15{,}000x + 14{,}150y - 45{\cdot}0 \times 10^6$ | 1465 | $14{,}150x + 13{,}350y - 42{\cdot}4 \times 10^6$ |
| NQ .... | 45 | 0·279 | 10·80 | 10·40 | −32,500 | 1739 | $18{,}800x + 18{,}100y - 56{\cdot}6 \times 10^6$ | 1675 | $18{,}100x + 17{,}420y - 54{\cdot}5 \times 10^6$ |
| *Stbd* | | | | | | | | | |
| cc .... | 45 | 0·279 | − 2·715 | − 1·35 | 14,750 | 437 | $1{,}190x + 590y - 6{\cdot}4 \times 10^6$ | 217 | $590x + 290y - 3{\cdot}2 \times 10^6$ |
| eg .... | 45 | 0·279 | − 4·96 | − 3·86 | 20,250 | 799 | $3{,}970x + 3{,}080y - 16{\cdot}2 \times 10^6$ | 622 | $3{,}080x + 2{,}410y - 12{\cdot}6 \times 10^6$ |
| gj .... | 45 | 0·279 | − 6·79 | − 5·91 | 24,800 | 1095 | $7{,}440x + 6{,}470y - 27{\cdot}2 \times 10^6$ | 954 | $6{,}470x + 5{,}640y - 23{\cdot}6 \times 10^6$ |
| jl .... | 45 | 0·279 | − 8·36 | − 7·67 | 28,900 | 1346 | $11{,}250x + 10{,}330y - 39{\cdot}0 \times 10^6$ | 1235 | $10{,}330x + 9{,}490y - 35{\cdot}8 \times 10^6$ |
| ln .... | 45 | 0·279 | − 9·70 | − 9·16 | 32,500 | 1562 | $15{,}150x + 14{,}300y - 50{\cdot}7 \times 10^6$ | 1475 | $14{,}300x + 13{,}500y - 48{\cdot}0 \times 10^6$ |
| nq .... | 45 | 0·279 | −10·85 | −10·45 | 35,500 | 1749 | $19{,}000x + 18{,}300y - 62{\cdot}2 \times 10^6$ | 1685 | $18{,}300x + 17{,}620y - 59{\cdot}9 \times 10^6$ |
| | | | | | | $\Sigma =$ | $115{,}590x + 105{,}630y - 374{\cdot}1 \times 10^6$ | $\Sigma =$ | $105{,}630x + 97{,}280y - 340{\cdot}4 \times 10^6$ |

It should be noted that the term "E" (Young's Modulus) has been omitted throughout the strain energy calculations, since the entire structure is of steel.

The strain energy calculations—derived from Tables 2, 3 and 4—are summarised overleaf. The resultant equations are seen to be readily soluble in terms of $x$ and $u$, and hence in terms of $x$ and $y$.

It will be instructive at this point to compare Tables 2 and 5. Both of these give the strain energy calculations for the top longerons. Table 2 presents them in accordance with the proposed new method in terms of $x$ and $u$; Table 5 gives them in the standard manner, in terms of $x$ and $y$. In Table 5 all the terms in $x$ and $y$ are seen to increase at an almost uniform rate on passing from the stern to the front end of the fuselage, and to become nearly identical at the forward end. In Table 2 the terms in $u$ increase in the above manner, while the terms in $x$ diminish rapidly. There is no possibility with the proposed new method of arriving at two final simultaneous equations that are almost identical.

TABLE I.—SUMMARY OF LONGERON LOADS.

| Member | Loads in terms of "x" | | | Loads in terms of "u" | | | Known Load = "C" |
|---|---|---|---|---|---|---|---|
| | Plan | Truss | Total = "a" | Plan | Truss | Total = "b" | |
| *Top Port—* | | | | | | | |
| CE | 1·50 | −0·15 | 1·35 | 0 | 1·35 | 1·35 | − 8,100 |
| EG | 1·365 | −0·27 | 1·10 | 1·35 | 2·45 | 3·80 | − 14,750 |
| GJ | 1·25 | −0·375 | 0·88 | 2·51 | 3·38 | 5·89 | − 20,250 |
| JL | 1·15 | −0·46 | 0·69 | 3·46 | 4·16 | 7·62 | −24,800 |
| LN | 1·07 | −0·535 | 0·54 | 4·29 | 4·82 | 9·11 | −28,900 |
| NQ | 1·00 | −0·60 | 0·40 | 5·0 | 5·40 | 10·40 | −32,500 |
| *Top Starboard—* | | | | | | | |
| *ce* | −1·365 | 0 | −1·365 | −1·35 | 0 | − 1·35 | 14,750 |
| *eg* | −1·25 | 0·15 | −1·10 | −2·51 | −1·35 | − 3·86 | 20,250 |
| *gj* | −1·15 | 0·27 | −0·88 | −3·46 | −2·45 | − 5·91 | 24,800 |
| *jl* | −1·07 | 0·375 | −0·69 | −4·29 | −3·38 | − 7·67 | 28,900 |
| *ln* | −1·00 | 0·46 | −0·54 | −5·0 | −4·16 | − 9·16 | 32,500 |
| *nq* | −0·94 | 0·54 | −0·40 | −5·63 | −4·82 | −10·45 | 35,500 |
| *Bottom Port—* | | | | | | | |
| DF | −1·365 | 0 | −1·365 | −1·35 | 0 | − 1·35 | 8,200 |
| FH | −1·25 | 0·15 | −1·10 | −2·51 | −1·35 | − 3·86 | 11,250 |
| HK | −1·15 | 0·27 | −0·88 | −3·46 | −2·45 | − 5·91 | 13,850 |
| KM | −1·07 | 0·375 | −0·69 | −4·29 | −3·38 | − 7·67 | 16,050 |
| MP | −1·00 | 0·46 | −0·54 | −5·0 | −4·16 | − 9·16 | 18,050 |
| PR | −0·94 | 0·54 | −0·40 | −5·63 | −4·82 | −10·45 | 19,700 |
| *Bottom Starboard* | | | | | | | |
| *df* | 1·50 | −0·15 | 1·35 | 0 | 1·35 | 1·35 | − 4,500 |
| *fh* | 1·365 | −0·272 | 1·10 | 1·35 | 2·45 | 3·80 | − 8,200 |
| *hk* | 1·25 | −0·375 | 0·88 | 2·51 | 3·38 | 5·89 | −11,250 |
| *km* | 1·15 | −0·46 | 0·69 | 3·46 | 4·16 | 7·62 | −13,850 |
| *mp* | 1·07 | −0·535 | 0·54 | 4·29 | 4·82 | 9·11 | −16,050 |
| *pr* | 1·00 | −0·60 | 0·40 | 5·0 | 5·40 | 10·40 | −18,050 |

*Summary of Strain-Energy Calculations*

| | $\Sigma \frac{l}{A} \times a \times (ax + bu + c)$ | $\Sigma \frac{l}{A} \times b \times (ax + bu + c)$ |
|---|---|---|
| Top longerons ... | $1{,}531x + 8{,}250u - 33{\cdot}20 \times 10^6$ | $8{,}250x + 97{,}280u - 340{\cdot}4 \times 10^6$ |
| Bottom longerons | $1{,}715x + 9{,}220u - 20{\cdot}68 \times 10^6$ | $9{,}220x + 108{,}710u - 211{\cdot}3 \times 10^6$ |
| Plan wires ... | $363x - 3{,}690u + 13{\cdot}05 \times 10^6$ | $-3{,}690x + 37{,}590u - 132{\cdot}4 \times 10^6$ |
| Side wires... ... | $714x + 6{,}420u$ | $-6{,}420x + 57{,}860u$ |
| Total (= 0) ... | $4{,}323x + 7{,}360u - 40{\cdot}83 \times 10^6$ | $7{,}360x + 301{,}430u - 684{\cdot}1 \times 10^6$ |

Hence:

(1) $4{\cdot}323x + 7{\cdot}36u - 40{,}830 = 0$
*i.e.*, $0{\cdot}587x + u - 5{,}550 = 0$

(2) $7{\cdot}36x + 301{\cdot}4u - 684{,}100 = 0$
*i.e.*, $0{\cdot}024x + u - 2{,}270 = 0$

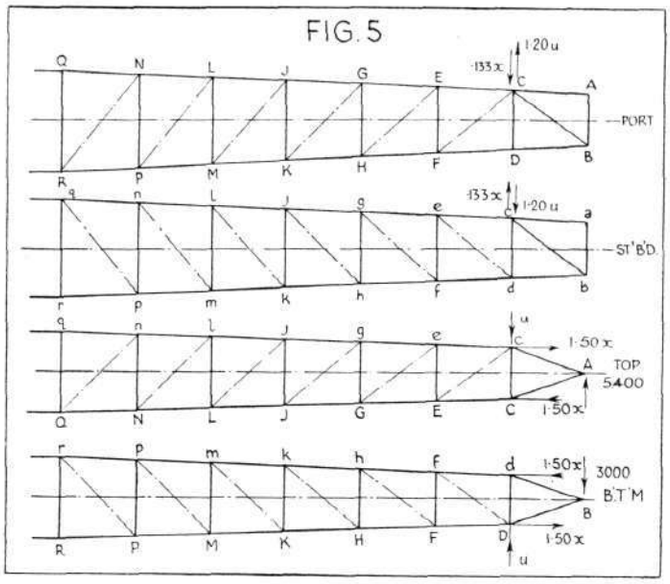
$0{\cdot}563x = 3{,}280$; $x = 5{,}830$ lb.

$u = 2{,}130$ lb. $(= x + y)$

$y = -3{,}700$ lb.

Another way of regarding the difference in treatment is as follows:—

The standard method of treating a rear fuselage with two "unknowns" is equivalent to evaluating two quantities that are nearly equal, and then subtracting one from the other. The advantage of the proposed method of attack lies in the fact that it deals directly in terms of the small difference between the two quantities. Thus in the attached strain energy calculations all the terms in $x$ are in the nature of this "small difference."




The above method may be readily extended to deal with three or more unknown reactions at the stern end.

Thus, in treating three unknown forces, $x$, $y$ and $z$, we may write:

$$u = x + y$$
$$v = x + y + z.$$

The load P in any fuselage member is then determined directly in terms of $x$, $u$ and $v$, in the form:—

$$P = ax + bu + cv + k.$$

Then

$$0 = \Sigma \left\{ \frac{l}{AE} \times a \times (ax + bu + cv + k) \right\}$$
$$= \Sigma \left\{ \frac{l}{AE} \times b \times (ax + bu + cv + k) \right\}$$
$$= \Sigma \left\{ \frac{l}{AE} \times c \times (ax + bu + cv + k) \right\}$$

# TECHNICAL LITERATURE

## SUMMARIES OF N.A.C.A. TECHNICAL REPORTS

The National Advisory Committee for Aeronautics is the American equivalent of our Aeronautical Research Committee, with headquarters at Washington, D.C. The Technical Reports issued by the N.A.C.A. are obtainable from the Superintendent of Documents, Washington, D.C., U.S.A. In the summary printed below the price of the Report is given. This price is net, and a small amount should be added to cover postage. For the guidance of potential purchasers it may be pointed out that the Reports rarely exceed 5 oz. in weight.

NO. 387. THE VERTICAL WIND TUNNEL OF THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS. By Carl J. Wenzinger and Thomas A. Harris. Price 10 cents.

The vertical open-throat wind tunnel of the N.A.C.A. is described in this report. The tunnel was built mainly for studying the spinning characteristics of airplane models, but may be used as well for the usual types of wind-tunnel tests. A special spinning balance is being developed to measure the desired forces and moments, with the model simulating the actual spin of an airplane.

Satisfactory air flow has been attained with a velocity that is uniform over the jet to within 0·5 per cent. The turbulence present in the tunnel has been compared with that of several other tunnels by means of the results of sphere drag tests, and was found to average well with the values of those tunnels. Included also in the report are comparisons of results of stable autorotation and of rolling moment tests obtained both in the vertical tunnel and in the old-horizontal 5ft. atmospheric tunnel.

(FLIGHT *Photo.*)

# The Gloster Troop Carrier

AIRCRAFT specially designed for the rapid conveyance of troops are not by any means a novelty, and have been in use for many years by the British Royal Air Force in the East. But, as in every other branch of service aviation, progress is rapid, conditions change, and the demands upon the type grows more and more severe. With a view to develop a high-performance aircraft of good carrying capacity, capable not only of carrying troops but also a good deal of defensive armament, the "Gloster" Bomber-Transport machine shown in our photographs was produced by the Gloster Aircraft Co., Ltd., at their Hucclecote works. As the photographs show, the machine is a large four-engined biplane (95 ft. span, all-up weight 28,000 lb.) of exceptionally clean aerodynamic design, and of all-metal construction. The fuselage has a metal skin, and is of good streamline form, while the tandem arrangement of the Rolls-Royce "Kestrel" engines makes for low frontal area. Performance figures may not be published at the moment, but the new machine is very fast indeed and has a good range when carrying its full complement of troops (30) and their equipment.

The main cabin is very roomy, with a length of 27 ft. 8 in., a width of 7 ft., and a height of 7 ft. 3 in. Owing to the type of construction adopted, this space is entirely without bracing members and therefore gives a high degree of freedom of movement to the occupants.

For use in case the machine should be employed for the carriage of loads other than troops, there is a hatchway in the roof and a trap door in the floor of the cabin. The hatchway is provided with a runway and pulley block, so that bulky objects up to a weight of 1,120 lb. can be hoisted into the fuselage and placed anywhere within the cabin.

The four Rolls-Royce "Kestrel" engines, which are of the fully supercharged type, developing 540 b.h.p. each at 12,000 ft., are mounted in tandem pairs in nacelles in the gap between upper and lower wings. The nacelles, it will be seen, have been very carefully streamlined, the water-cooled engines lending themselves very well to an installation of this type, although the exposed radiators slightly spoil the low drag thus obtained. However, it will

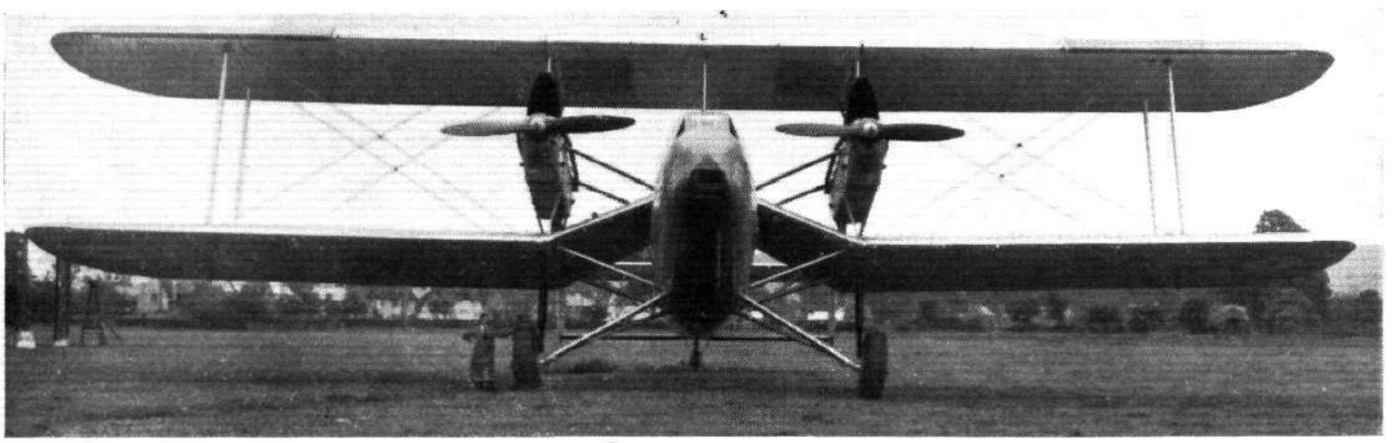
**THE TANDEM ENGINE ARRANGEMENT: The four Rolls-Royce "Kestrel" engines (supercharged) are mounted in tandem pairs between the wings, the nacelles being, it will be seen, of good shape and smooth lines.** (FLIGHT *Photo.*)


**THE UNUSUAL TAIL UNIT : The horizontal tail surfaces are of sesquiplane form, while the large fins and rudders close in the ends of the tail.** (FLIGHT *Photo.*)

be agreed that considering that in each nacelle there are considerably more than 1,000 " horses " to be cooled, the size of radiator is quite diminutive. Doubtless discerning readers will be able to draw their own conclusions from this fact.

The Gloster Bomber-Transport will, we understand, be on view at the R.A.F. Display at Hendon on June 25, in the new Aircraft Park, and there many of our readers will have an opportunity to see the machine for themselves.

The fundamental difference between a troop carrier and a civilian aircraft designed to carry passengers is not great, and we would suggest that the new Gloster machine might well make a very fine passenger aeroplane. For civil work the performance, in the way of speed at altitude, would probably not be quite so important, and in that case it might be possible to increase the gross weight to 30,000 lb. and to fit medium supercharged " Kestrels " of 525 b.h.p. at 2,000 ft. With a power plant divided into four units, and a fairly low power loading such as this arrangement would give, there should be little or no likelihood of such a machine ever having to make a forced landing in unsuitable country, as it would always be able to continue its flight until a suitable field was found. Although the cabin might not be quite large enough to house as many passengers as the machine would carry, it should be possible to seat quite a reasonable number, and to stow elsewhere a very considerable mail load, for the carriage of which the high speed would make the machine very suitable.



**LOW FRONTAL AREA : This front view illustrates the clean design which characterises the Gloster Troop Carrier.** (FLIGHT *Photo.*)

**Prince George at K.L.G. Works**

THE K.L.G. Works at Putney Vale, London, S.W.15, were recently honoured by a visit by Prince George. His Royal Highness was accompanied by the Chief Inspector of Factories, but the visit was marked by the complete absence of formality. The greatest interest was taken in the manufacture of K.L.G. Sparking Plugs, particularly in a new automatic machine which, it is claimed, has a greater weekly output of plug bodies than any similar machine in Europe.

**A New Member of the Gipsy Family**

AMONG the latest additions to the range of the well-known Gipsy engines is the IIIA. This is an inverted four-cylinder in-line air-cooled aircraft engine following the already well-known design lines of the Gipsy III. It has recently passed its first type test successfully, and although its details are still shrouded in secrecy, the increased dimensions and r.p.m. are understood to have resulted in a substantial increase in power. Two machines using this engine have been entered for the King's Cup race ; the first of these is G-ABUT, a " Fox Moth " entered by the designer, Mr. A. E. Hagg and flown by Mr. W. L. Hope ; the second is what will presumably be a Special D.H. " Moth," G-ABVW, entered by Lord Wakefield and flown by Capt. H. S. Broad. The de Havilland Aircraft Co. have consistently done well in the King's Cup race, and this race has often seen the début of their latest products. The performance of this engine will be watched with interest, for although we ourselves do not favour the all-round increase in power which would appear to be the most general method of increasing the performance of light aircraft, yet there is no doubt that, where this increase is not accompanied by a great increase in weight, it will undoubtedly result in a greater pay-load for a truly commercial aircraft like the " Fox Moth."

**Director of Civil Aviation, India**

CAPT. A. EADON has accepted the post of deputy director of civil aviation in India. Capt. Eadon, it need hardly be mentioned, was Principal and founder of the de Havilland Aeronautical Technical School.

# Boulton & Paul P.32

YET another aircraft which will be seen at the R.A.F. Display at Hendon on June 25 is the Boulton & Paul P.32, which is a three-engined night bomber of all-metal construction, fitted with three of the new Bristol "Pegasus" engines.

From the photograph it will be seen that the P.32 has a somewhat unusual engine arrangement in that the central engine is not placed in the nose of the fuselage, but on the top centre-section. Of recent years there has been noticeable a tendency to avoid the nose engine in multi-engined aircraft. There are various reasons for this, chief among them being the fact that with the central engine removed from the nose of the fuselage, the cockpits can be so arranged as to give pilot and bomber a very much better view, making the aircraft the equal, in this respect, of a twin-engined machine. There was a time when certain doubts existed concerning the soundness of placing one or more engines so high above the centre of resistance, and types produced many years ago with this engine arrangement were far from being successful. However, the latest types of aeroplanes having engines on or near the top plane of a biplane have not shown any pronounced vices, and the arrangement is now accepted as quite a permissible one, while giving a number of advantages in other respects.

The Boulton & Paul P.32 is of the type of construction which this firm has developed during a long period of years, with high-tensile steel in the primary structure.

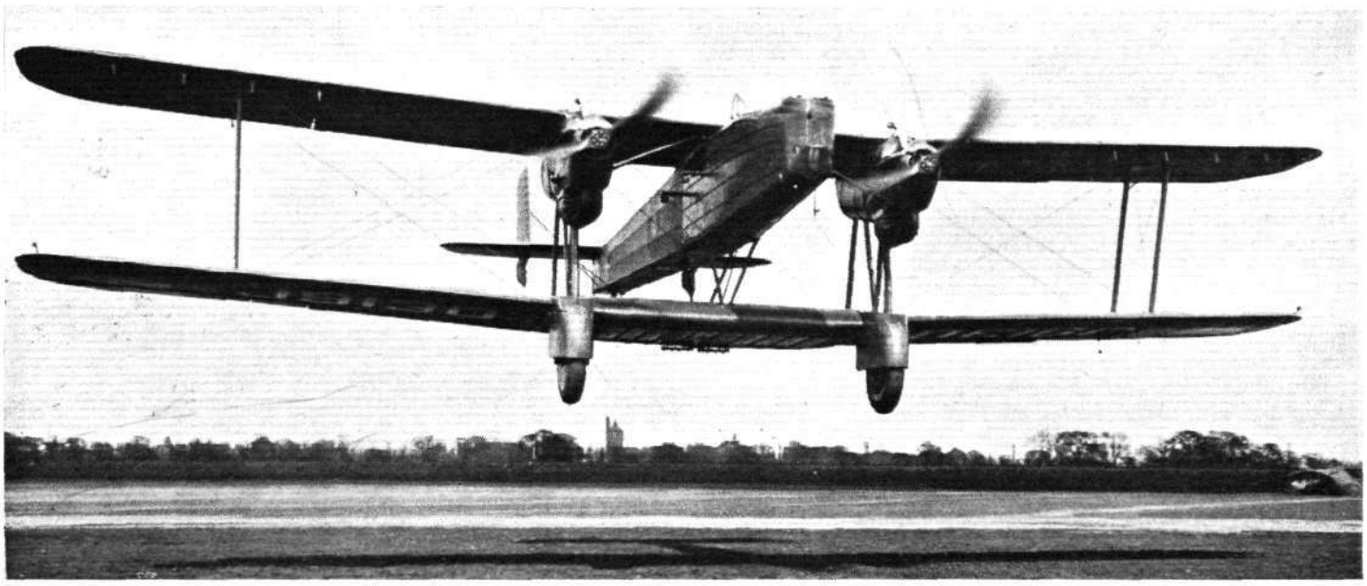

**THE BOULTON & PAUL P.32 NIGHT BOMBER : The Central "Pegasus" engine is mounted on the top centre section, with the result that the view for pilot and front gunner is excellent.** *(R.A.F. Official, Crown Copyright Photo.)*

An undercarriage of the four-wheeled type is fitted, springing being by Boulton & Paul oleo-pneumatic shock-absorbing legs. Brakes are fitted on all four wheels, and as there is a castoring tail wheel, the machine is, what with outboard engines, remarkably manœuvrable on the ground.

Great attention has been given to the control system of the P.32, and the machine is reported to be particularly light on the controls. The ailerons have Bristol-Frise balances, while elevators and rudders are servo-operated.

That the P.32 is a large aircraft will be seen from the following figures—the only ones which it is permissible to publish at present.

The overall length is 47 ft. 6 in. and the wing span 100 ft. The height over the central engine is 22 ft., and the total wing area 2,090 sq. ft. As the gross weight is 22,700 lb., the wing loading becomes just under 11 lb./sq. ft., and the power loading (at 3 × 555 h.p.) 13.7 lb./h.p. The particular Bristol "Pegasus" engines fitted each develops 555 b.h.p. at 4,500 ft.



**THE HANDLEY PAGE H.P. 38 : This machine, produced two years ago, is still surrounded with a certain amount of secrecy. It is a night bomber with high performance, and the arrangement of the fuselage and engines is such as to provide monoplane view while retaining biplane manœuvrability. Wing span 75 ft. Gross weight 15,600 lb. The H.P. 38 will be seen at Hendon on June 25.** (FLIGHT *Photo.*)

# Air Transport

## THE ISLE OF WIGHT AIR FERRY

SOME little while back we published particulars of a proposed air service between Portsmouth and the Isle of Wight, to be operated by Wight Aviation, Ltd., now known as the Portsmouth, Southsea and Isle of Wight Aviation, Ltd. Recently the company in question received delivery of a Westland "Wessex" cabin *monoplane* (three Armstrong-Siddeley "Genet Major" engines), which will be employed on this service, and we now publish an illustration of this machine.

Pending the completion of the company's aerodrome at Ryde, I.O.W., this "Wessex," G-ABVB, is being put to joyriding work at the Portsmouth Municipal Aerodrome, where it has been doing "good trade."

Although much the same as the standard "Wessex," certain modifications have been made in this machine; the fuselage has been made larger, both as regards height and width, and the cabin has been arranged to give increased seating capacity. This now provides for six seats instead of four, while for freighter work all seats can be removed very easily. The pilot's cockpit is also rather higher than standard, enabling a backward view to be obtained over the cabin roof. Townend rings have been fitted to the engines which give a definite increase of speed of about 4 m.p.h.; they are easily removable so as not to interfere with maintenance.

We understand that the Portsmouth, Southsea and Isle of Wight Aviation, Ltd., propose operating a "feeler" service between Shoreham and the Isle of Wight, calling *en route* at Portsmouth. Should this prove popular, no doubt it will be continued as a regular service in addition to the Portsmouth-Isle of Wight Ferry already planned and shortly to be inaugurated.


**FOR THE ISLE OF WIGHT SERVICE: A Westland "Wessex" (three Armstrong-Siddeley "Genet Majors") recently delivered to the Portsmouth, Southsea and Isle of Wight Aviation, Ltd.**

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**Record London-Paris Air Traffic**

MORE passengers flew by Imperial Airways between London and Paris during May, 1932, than on any previous month since the inception of the cross-Channel air services 13 years ago. Between May 1 and 31 the record number of 3,372 travellers were flown between the two capitals in the airliners of Imperial Airways. The previous record monthly figure for passenger traffic on this London-Paris route was 3,304, set up also by Imperial Airways, in the height of the holiday period in August, 1928.

**Persia and India Air Mail**

AUTHORITY has been given by the Persian Government for the India air mail to continue to use the existing route along the Persian Gulf up to October 1. The original agreement with the Persian Government expired at the end of March, and was then extended for two months. Steps have since been taken to organise an alternative route on the Arabian side of the gulf. That route will be available should there be no further extension after October.

**Karachi-Bombay-Madras Air Mail**

SIR SAMUEL HOARE, Secretary of State for India, in reply to a question in the House on May 30, stated that the Government of India had recently concluded an agreement with Messrs. Tata Sons, Ltd., for the operation by that firm of a weekly air mail service in both directions between Karachi and Madras via Bombay, to commence not later than September 15 next, and to connect at Karachi with the London-Karachi air services.

**Combined Ship-Air Transatlantic Mail Service**

IT is reported from Ottawa that a fast combined ship and air Transatlantic mail service is being arranged for the convenience of delegates attending the Imperial Economic Conference in July. During the Conference mail 'planes will meet incoming steamers off the coast of Newfoundland in the Belle Isle Straits to take off the mail for quick transmission to Ottawa. A five-day service between London and Ottawa will be arranged under this scheme. Letters leaving London late on Monday night or early Tuesday morning will be delivered in Ottawa on the following Saturday morning. Corresponding facilities are arranged for the outgoing mails from Ottawa to London.

**Air Transport and African Colonies**

ATTENTION was drawn in the House of Commons on May 31 to the high charges made by African Colonial railway and steamship companies for the carriage of aircraft fuel and necessaries. The Colonial Secretary explained that the present financial position of the railways would make it very difficult for them to give cheaper rates.

**Air Mail to Brazil**

THE Postmaster-General was asked in the House of Commons on May 31 why the charge for sending air-mail letters to Brazil was 3s. 6d. per half-ounce but only about 1s. in sterling for a letter from Rio to London. The reply was that 1s. 3½d. postage covered only about ⅙ oz. and for ½ oz. the charge was roughly 3s. 4d.

**Air Mail Profits**

THE Postmaster-General, in reply to a question in the House on May 24, stated that the profits on air-mail fees since 1925 have been:—Year ended March 31, 1926, £500; year ended March 31, 1927, £650; year ended March 31, 1928, £2,000; year ended March 31, 1929, £1,850; year ended March 31, 1930, £6,350; year ended March 31, 1931, £1,000.

# Private Flying and Gliding

## AVIATION AT BROXBOURNE

SUNDAY, June 12, was the first day of a heat wave and at few places was the weather it brought more welcome than at Broxbourne Aerodrome, where the Herts and Essex Aero Club held their annual Flying Display.

At first sight Broxbourne appears to be some distance from a populous neighbourhood, but this cannot be the case for fully 10,000 people came to the meeting.

Just after 2.30 p.m. Miss Amy Johnson and Mr. J. Mollison arrived in the former's "Moth" (Gipsy I), and thereafter proceeded to declare the Display open. Miss Johnson recalled the pleasant times she had previously had at Broxbourne and wished the Club every success.

The fly past which followed the opening included a very representative selection of aircraft, among which were "Puss Moths" (Gipsy III's) from the Dominion Motor Spirit Co., the National Benzole Co., Brian Lewis & Co.; "Desoutters" (Hermes II.B); "Moths" (Gipsy and Cirrus) from both the Herts and Essex Club and the L.G.O.C. Flying Club; "Avians" (Gipsy II), one from the Shell-Mex & B.P. Co.; Comper "Swift" (Pobjoy), also from Shell-Mex & B.P.; "Spartans" (Gipsy II and Hermes) from the Cirrus-Hermes Eng. Co., and the Spartan Aircraft Co.; "Redwings" (Genet); Martlets (Genet and Gipsy); and the new all-metal "Wessex" (three Genets) of the Portsmouth & Isle of Wight Aviation Co. Just as these aircraft were about to land a new arrival came in low over the clubhouse; this was a Hawker "Tomtit" (Hermes).

Mr. D. Kinnear, the instructor of the L.G.O.C. Club, took up Mr. H. Ward, who made a perfect parachute descent with a Russell Lobe parachute, landing right in the centre of the aerodrome; he also made another descent at the end of the meeting, but this time he misjudged the wind strength a little and was carried into the middle of the public enclosure. Such is the cupidity of the average spectator that there was some difficulty in rescuing his parachute from those who evidently thought that they would endear themselves to their wives and sweethearts by taking home a few yards of white silk with them!

Aerial paperchasing was a new item and for this purpose F/O. W. R. Bannister, in a "Moth" (Cirrus III), released rolls of special paper which unfurled themselves as they floated down. He then dived into the resulting streamers and chopped them up with his airscrew, a proceeding which amused the crowd greatly.

Mr. Kinnear demonstrated the L.G.O.C. Club's "Redwing" (Genet), showing off its good climb and slow-flying properties admirably, while Capt. Marc Diamant provided a contrast by bringing the "Puss Moth" (Gipsy III) of the Dominion Motor Spirit Co. across the aerodrome in front of the enclosures at speed.

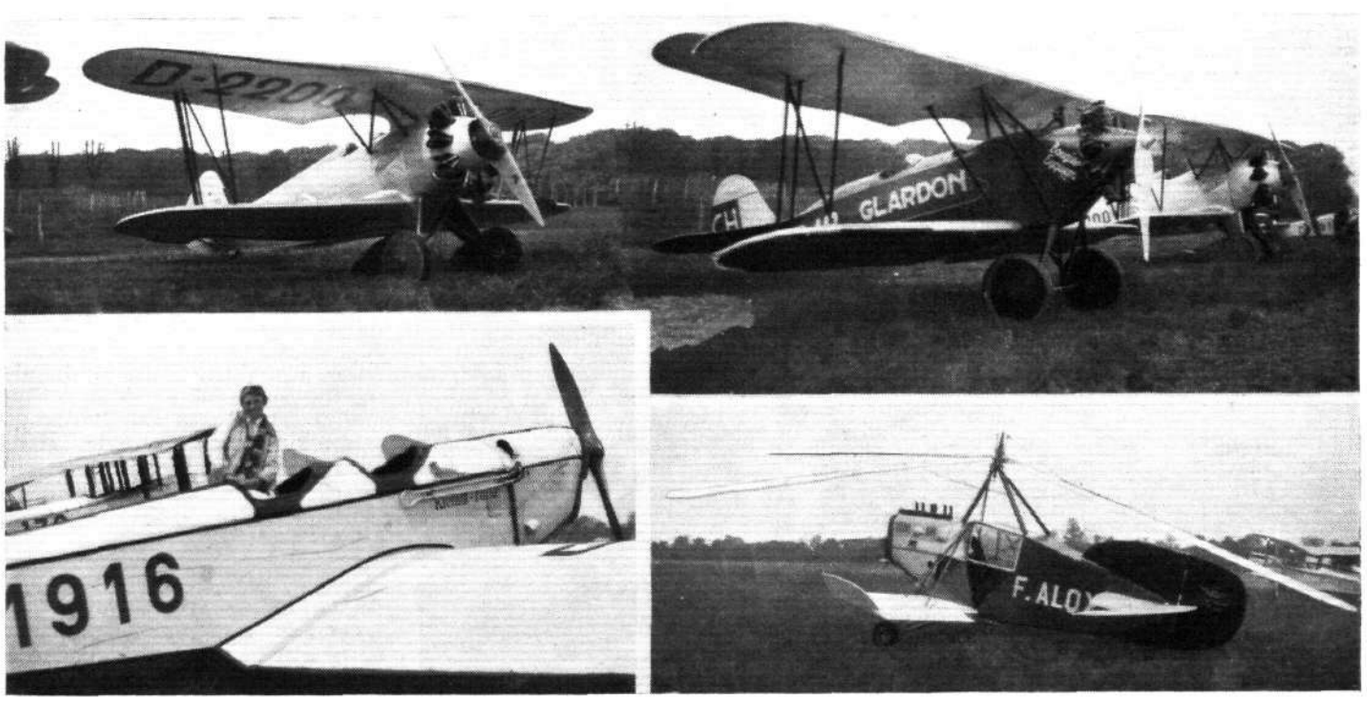
Aerobatics were demonstrated by Mr. Kinnear in a "Martlet" (Genet) and by Flt. Lt. C. Clarkson in a Comper "Swift" (Pobjoy); both pilots showed themselves thoroughly at home in their respective machines, and besides their displays they indulged in a mock combat which gave the spectators some idea of the manœuvres of an aerial fight.

Finally we were treated to the sight of Mr. Newman, manager of the Crystal Palace Speedway, riding a motorcycle through a sheet of glass.

Altogether, the show went off very well indeed, and it was quite a cheery little party.

## SAINT-GERMAIN-EN-LAYE INTERNATIONAL MEETING

INTERESTING exhibitions of aerobatic and stunt flying by leading international aces, parachute jumping, the presentation of several new planes and the attendance of a number of prominent aeronautical personalities were the features of the International Aviation Meeting held at Saint-Germain-en-Laye (Paris Suburb) on Sunday afternoon, June 5. The meeting was organised by the Air Propaganda Society of Paris, and was held under the auspices of the local municipality. The attendance was very large, the grand stands and grounds being




**MACHINES AT THE INTERNATIONAL AVIATION MEETING, ST. GERMAIN-EN-LAYE: Top left, G. Fieseler's "Tiger F.2" (340-h.p. Walter engine) which was built to his design at the Kassel Aeroplane Works. Right, the Raab-Katzenstein biplane (120 Siemens) flown by the Swiss Ace, Victor Glardon. Bottom, left, Miss Liesel Bach (Germany) and her Klemm (100-h.p. inverted Argus). Right, the Weyman two-seater cabin Autogiro (100-h.p. Hispano Suiza).**

crowded and all points of vantage outside, even numerous trees, being occupied.

Marcel Doret, George Cavalli and Miss Adrienne Bolland represented France, Gerhard Fieseler and Miss Liesel Bach Germany, and Victor Glardon Switzerland in the aerobatic and stunting contests. The transatlantic aviators, Dieudonne Costes, Maurice Bellonte, Rene Lefevre and Miss Amelia Earhart were among the distinguished visitors. French, German and Swiss planes were lined up in a row in front of the grand stand and made an interesting showing.

Maurice Bellonte opened the meeting in his Potez 36, and Miss Amelia Earhart arrived shortly afterwards in a Farman 190 (300-h.p. Gnome & Rhone K.7), piloted by the Viscount de Sibour. Miss Earhart was greeted with great enthusiasm, and was received by M. Louis Bonin, the Mayor of Saint Germain, George Chastenet, the Deputy of the district, and the Commandant Rignot, representing the Air Ministry. Dieudonne Costes arrived about the same time in a Morane "Moth" (85-h.p. "Gipsy"), and Rene Fonck, the well-known French war ace, was also present.

Stunt flying then followed, Fieseler flying his new two-seater biplane, the "Tiger F.2," which was built at the Kassel Aeroplane Works from his own designs. The machine has a wing spread of 28 ft. 6 in., and a supporting surface of 237 sq. ft. The wings have been constructed with a bi-convex camber to aid in inverted flying (flying on the back). The plane is equipped with a 340-h.p., nine-cylinder, radial Walter air-cooled motor. It has a speed of 155 m.p.h. (250 km./hr.) and can climb 1,000 m. in 1 min. 20 sec.

Doret followed Fieseler, flying his Dewoitine D.27 machine (400-h.p. Hispano-Suiza), and both airmen showed remarkable suppleness and great skill, their displays being liberally applauded by the crowd.

George Romaneschi, the parachutist, next gave demonstrations. Flying his Raab-Katzenstein biplane (120-h.p. Siemens engine), Victor Glardon gave an exhibition of inverted flying for 8 min. 12 sec. and other stunts. George Cavalli, one of the most promising of the younger French aces; Miss Liesel Bach, a leading German aviatrix, flying a "Klemm" 100-h.p. four-cylinder inverted Argus engine; and Miss Adrienne Bolland, of France, also gave exhibitions of aerobatic flying.

Among the planes exhibited which attracted a good deal of attention was a "Weyman" two-seater, cabin "Autogyro," flown by George Martin, a former air-line pilot. This machine was equipped with a Hispano-Suiza 100-h.p. engine, and has a speed of 103 m.p.h. It landed almost vertically, with practically no run after touching the ground.

R. C. W.

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## LANCASHIRE AERO CLUB

Advocates of a better standard of flying for private pilots will find staunch supporters in the Lancashire Aero Club. This club was one of the first to institute advanced flying for its members, and this policy has been maintained throughout the club's life.

Their periodical competitions have invariably been framed with a view to improving their pilots' ability and have for that reason taken the form of landing competitions, cross-country trials and similar contests. It is unfortunate, therefore, that the new subsidy agreement should not foster clubs like this one, but that it should continue to place a premium on the number of pilots put into the air in the shortest time without any regard whatsoever for the amount of flying done by the club members. The present arrangement simply encourages commercial firms to operate under the guise of a club and to turn out pilots, the majority of whom do very little flying after taking their "A" licence. Flying is still an expensive sport, and there is all the more reason, therefore, why the "A" licensed pilot should be encouraged and helped to fly more, thereby enlarging his experience and increasing the safety of the air; air which, incidentally, is already becoming quite unpleasantly crowded on certain routes near London.

This "better pilot" spirit of the Lancashire Club is still further fostered by their official organ (we hope Mr. Alan Goodfellow will forgive us for not referring to it as a bright journal—ED.) *The Elevator*. This month's issue contains two articles of considerable help to the less experienced pilots. Mr. George Yuill, the club's instructor, finishes his article on "Blind Flying"—his remarks that calling it "blind" flying is pure irony is very true and for that reason among others we prefer the term "instrument flying"—and Miss Winifred Brown writes very readably indeed on the subject of flying by compass. Everyone who reads that article cannot but be impressed with the type of pilot turned out by the Lancashire Aero Club.

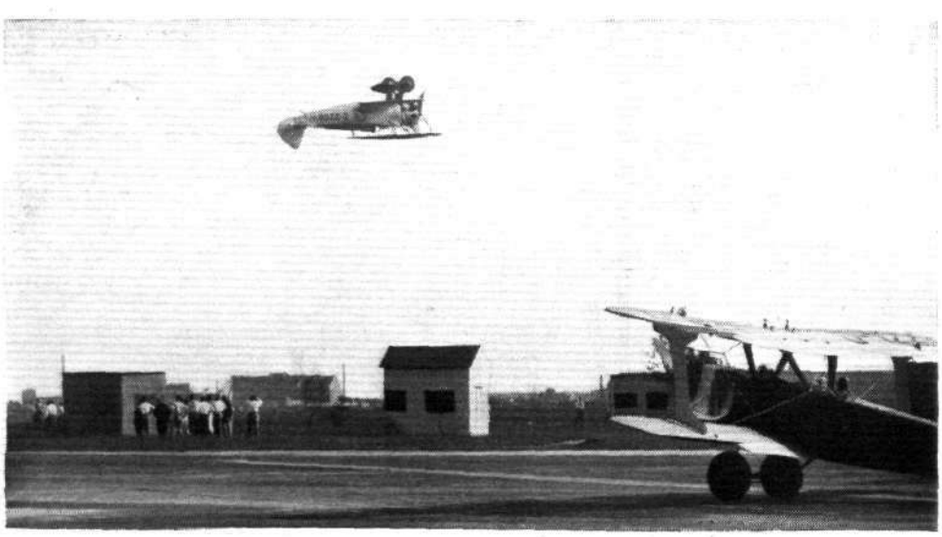
## LEICESTER

H.R.H. the Prince of Wales had tea in the clubhouse at Desford on Saturday, June 11, previous to his departure from a visit paid to the Leicester Agricultural Show. On his arrival at the aerodrome he was accompanied by Lord Lonsdale, the Lord Mayor and Lady Mayoress and Maj. Burnaby. After His Royal Highness had departed the chance was taken of giving the Lord Mayor and Lady Mayoress their first flight in the club's "Puss Moth." Their example was also followed by the Chief Constable of Leicester.

The landing competition held on Sunday resulted in a win for Mr. John Cobb; his average distance from the mark was 12 ft. 4½ in.

## BROOKLANDS

Pupils from abroad continue to arrive at the Brooklands Flying School, the latest being Mr. Morad, who has travelled from India specially to learn to fly in this country. The College of Aeronautical Engineering which recently formed its own aero club at the aerodrome is now in full swing, and a large amount of dual instruction has been given on their aircraft. Sales of aircraft for the past week amount to five, among which was the "Moth," Gipsy I, sold to Mr. Eric Leigh, who placed his order immediately he had obtained his "A" licence.



**IM RÜCKENFLUG: Herr Fieseler used his new "Tiger 2" at the International Flying Meeting at Tempelhof Aerodrome, Berlin, and he appears to be equally at home either side up.**

## HANWORTH

Sunday next will be the Royal Aeronautical Society's Garden Party at Hanworth. A large and varied number of aircraft will be displayed upon this occasion. Members are particularly requested to bring their membership badges and to provide their guests with vouchers. Lord Carlow has presented the club with a barograph, thermograph and max.-min. thermometer. This set of meteorological

**REAL INTEREST: A formation flight in "Albatros As" aircraft by pilots of the "Deutsche Verkehrsfliegerschute" on the occasion of the International Flying Meeting at Tempelhof Aerodrome, Berlin, June 12.**

instruments will be housed in a special case near the booking hut. Considerable instruction is now given in night flying, and last Wednesday Flt. Lt. Max Findlay was kept very busy in a club "Moth" fitted for the purpose. Others who were flying were Lt. Com. G. Rodd, R.N., in his "Puss Moth" and Lt. O. Cathcart-Jones in a "Stinson Junior."

## THE SOUTHERN AERO CLUB

Shoreham was ever a resort of those pilots who want to "go somewhere," particularly during week-ends, and now that the summer has officially started the air traffic at the aerodrome has increased largely. Work at the club continues to progress and the amount of flying done regularly now is considerable. The clubhouse was in the process of being refurbished during our last visit and will certainly be a most pleasant place in which to spend an afternoon when it is finished.

We understand that the plans for the development of the aerodrome on the east side of the existing one, as a municipal aerodrome for Brighton, Hove and Worthing, are going ahead favourably, and that the objections of certain individuals of the type which invariably oppose all forms of progress will be overruled in the near future. The opening of this aerodrome will provide a profitable attraction for those municipalities interested, and will form one of the most delightful ports of call for private owners on the south coast.

## PORTSMOUTH

The aerodrome at Hillsea, Portsmouth, which is being opened on July 2, is already in an excellent state, the surface having been prepared by Hunters, of Chester, and on a recent visit we found hangars and buildings being erected at top speed. There will for the start be one large hangar for commercial use, a public restaurant underneath the control tower, and a club hangar which has been built on to some old existing cottages in such a manner that these latter may be used as the clubhouse. The aerodrome is being run by the Portsmouth & Isle of Wight Aviation Co., who also operate the aerodromes at Shanklin and Ryde. We were fortunate enough to be able to try their new all-metal Westland "Wessex." This aircraft is admirably suited to the job of running passengers across to the Island and back, while its large capacity makes it equally suitable for joyriding. Councillor John Webb is the driving power of the Airport Committee of Portsmouth, and it is to him that the whole scheme owes its existence. We found him supervising the excavation of a large pit destined to contain storage tanks for the different petrol pumps; he is a man of parts, and is equally at home whether he is directing such work or sitting in the cockpit of an aircraft.

The pageant, which is being organised by Capt. R. Stocken to mark the opening of the aerodrome, will include many novel features as well as liberal assistance from the R.A.F. There will also be an educational display in the form of a large collection of aeroplane models all labelled so that the budding pilot can understand the different types. Besides the races for the Grosvenor Cup and the S.B.A.C. Challenge Trophy, there will be a race of some kind for a magnificent cup which has been presented locally. It is believed that this may take the form of an altitude race. In the evening there will be a dance given by the Lord Mayor in the Guildhall, to which all the pilots will be invited. Those who have not yet got entry forms for the races should apply to the Air Pageant Manager by June 20, or, at double fees, up to June 27.

## READING

The "At Home" which is being held on Saturday, June 18, promises to be of quite unusual interest. Visiting pilots are particularly asked to report at the control immediately upon arrival, while competitors for the annual Ladies' Race are asked to leave their aircraft in the special park allotted to them. A Cup for this race has very kindly been presented by the President of the Club, the Earl of Northesk. In connection with this meeting there will also be a *Concours d'Elegance* for the visiting aircraft.

## STAG LANE

An informal dance will be held at the clubhouse, Stag Lane, on Saturday, June 25, after the conclusion of the R.A.F. Display at Hendon. The club will be opened from 6.30 p.m. and cold suppers will be available. Dancing will commence at 8.30 p.m. and the charge of 3s. will include a buffet. It is hoped that many who will meet old friends at the Display will afterwards attend the dance.


**A NEW TYPE OF "MOTH": A recent addition to the de Havilland "family" is the wooden "Moth" shown here. It is fitted with the inverted "Gipsy III" engine, so that purchasers who prefer this engine can now be suited.**

*(FLIGHT Photo.)*

# Airisms from the Four Winds

**Atlantic Airman Rescued**

PERHAPS one of the most remarkable rescues in the history of aeronautics is that of Mr. Stanley Hausner, the Polish-American airman who left New Jersey on June 3 on a flight across the Atlantic to Warsaw. As previously reported in FLIGHT, he was long overdue on this side of the Atlantic, and practically all hope for his safety had been abandoned. On June 11, however, Capt. Wilson, of the British steamer *Circe Shell*, bound from Antwerp to New Orleans, was taking observations during evening watch some 550 miles off the coast of Portugal, when an object—thought at first to be a buoy—was observed in the water some four miles off. Closer inspection revealed it to be the tail of an aeroplane one third submerged. The *Circe Shell* at once approached and later a figure was seen clinging to the machine. A blast from the steamer's siren brought frantic waves from the figure, and a lifeboat was at once lowered. On reaching the machine the figure called "I'm Stanley Hausner; save my ship," and then he literally fell into the lifeboat. Hausner was taken on board the steamer where, saying "Thanks very much Captain, I have been waiting for you for eight days," he collapsed. He was terribly exhausted, but otherwise unharmed, and at the time of writing is making satisfactory progress, although unable to give a full and coherent account of his experiences. It is, perhaps, a happy coincidence that "Shell" have not only supplied the petrol for this unsuccessful Atlantic flight, but have also assisted in his timely rescue—"Shell Service" indeed!

**News of German Airmen on Australian Flight**

FOR some time past anxiety has been felt for the safety of the German pilot Capt. Hans Bertram and his companion Herr Clausman, who were engaged on a trade propaganda flight to the Far East, and who left Kupang, Timor, for Darwin on May 16 and had not been heard of until early this week. On June 13 a message from Wyndham stated that natives had found the tracks of two white men proceeding in a southerly direction 100 miles N.W. of Wyndham and had also found a bag, handkerchief and cigarette box with a message in German scratched on it. Later the missing Junkers seaplane was found near Drysdale Mission Station, near Wyndham, with a message that the airmen had gone into the bush. A West Australian Airways aeroplane has been sent out to search for the two men, and while game, fish and fresh water are abundant in the bush here, the Aborigines are said to be treacherous.

**Mlle. Lena Bernstein Poisoned**

A CERTAIN amount of mystery surrounds the announcement from Algeria of the death of the well-known French airwoman, Mlle. Lena Bernstein. After having been missing for several days, her body was discovered in an unfrequented corner of the aerodrome of Biskra last week. Death was due to poisoning, and the police were inclined to the view that she had taken her own life, as she had been depressed since a sandstorm had destroyed her aeroplane, in which she had planned to recapture the women's record for a long-distance flight that she had held until Miss Amelia Earhart flew the Atlantic.

**Miss Amelia Earhart Returning Home**

ON June 8, Miss Amelia Earhart flew as passenger in an Italian machine from Milan to Rome, where she was received by the U.S. Ambassador and Gen. Balbo, and later entertained at an official dinner. Miss Earhart subsequently returned to Paris, and on June 12 flew in the Comte de Sibour's machine to Brussels, where she was entertained at dinner at the U.S. Embassy. The next day she was the guest of the King and Queen of the Belgians at the Palace of Laeken, when the King bestowed upon her the medal of a Knight of the Order of Leopold. On June 14 Miss Earhart left Le Havre for New York in the *Ile de France*.

**The Hermes IV Passes its Type Test**

THE latest production of the Cirrus-Hermes Engineering Co., Ltd., of Croydon, is the Hermes IV. Little is as yet allowed to be published concerning this model, but it is now known that it has passed its 50-hr. Type Test with flying colours. Certain features have been redesigned in the light of the knowledge gained with the previous models, and these have resulted in an increase of power. This engine will now be used either as an upright engine or as an inverted one, whichever the customer prefers. A noteworthy feature of this test is that it was carried out from start to finish using ordinary No. 1 petrol as sold everywhere by the Dominion Motor Spirit Co., Ltd. This is, we believe, the first time an engine has been type tested on ordinary No. 1, and it speaks volumes for the confidence the makers had in their product that they should have relied on this fuel. More particularly is this so when it is realised that the test as now constituted involves running the last ten hours at full power, but at climbing revolutions, that is, at nine-tenths the cruising revolutions. A most severe test, which in reality is in the form of a very prolonged detonation test. The Hermes IV, however, made light of it, and after the completion of the 50th hour, went on to do the overload and high-speed tests of an hour each without any trouble whatsoever. When stripped, the engine appeared as new, without signs of wear in any way whatsoever. One of these engines will be used in the "Gull," entered by Lt. Com. B. Leake for the King's Cup Race on July 8 and 9 next. This machine, of which great things are expected, is now rapidly approaching completion at the British Aircraft works, Maidstone, and in the hands of Capt. E. W. Percival it is sure to give as good account of itself as did its prototype, the "Hendy 302," which also used a Hermes engine, and secured the fastest time in many of the races in which it took part.

**A Flight from Australia**

MR. J. M. WEIR, of Sydney Aerodrome, left Port Darwin in a D.H. "Gipsy Moth" on June 6, on a "leisurely" flight to England. He reached Kupang the same day and Batavia on June 9.

**Airspeed "Ferry's" Full Load**

LADY COBHAM has asked us to correct the statement made in last week's issue that during the Bristol meeting the "Ferry" flew from Bristol to Cardiff with but three or four passengers. Lady Cobham herself wanted to go to Cardiff with the machine, but as all seats were occupied she was unable to do so.

**Air Manœuvres at Calais**

ON June 21 and 22 a sham aerial attack will be made on the coast towns in the neighbourhood of Calais by air squadrons of the French force under the direction of Marshal Pétain, who is the officer in charge of all the air defence of France.

**Flying Club Subsidies**

MR. PERKINS asked the Under-Secretary for Air in the House on June 2 whether he would consider the advisability of restricting all subsidies to light aeroplane clubs only to those pilots who fly more than 25 hours a year; to which Sir Philip Sassoon replied that the serious financial loss which would be caused to the clubs by the suggestion rendered it impracticable.

**The Ottawa Conference and the Air**

THE Dominions Secretary of State (Mr. Thomas) stated in reply to a question in the House on May 31 that, in view of the full discussions on Empire air communications at the Imperial Conference of 1930, His Majesty's Government in the United Kingdom did not contemplate the inclusion of this subject in the agenda for the Ottawa Conference; but they would take advantage of any opportunity which arose of discussing particular aspects of it with representatives of individual Governments.

**National Aviation Day Displays**

DISPLAYS in connection with Sir Alan Cobham's National Aviation Day Campaign will be held as follow:—June 18, Bradford, Municipal Airport, Yeadon; June 19, Sherburn-in-Elmet, The Aerodrome; June 20, Leeds, Middleton Park; June 21, Skipton, Waltonwrays, Carleton Fields; June 22, Ripon, The Racecourse; June 23, Preston, Mete House Farm, Walton Bridge, Fishwick; June 24 and 25, Lancaster, Scale Hall, Morecambe Road; June 26 and 27, Blackpool, The Municipal Aerodrome, Stanley Park; June 28, Fleetwood, The Foreshore; June 29, Kendal, The Agricultural Show Field; June 30, Carlisle, Orton Grange, Wigton Road; July 1, Alnwick, Greensfield Moor Farm, Morpeth Road.

# THE ROYAL AIR FORCE

*London Gazette, June 7, 1932.*

*General Duties Branch*

The follg. Pilot Officers are promoted to rank of Flying Officer :—W. F. Hilchie, with seny. of March 12, 1932 (March 22) ; A. A. Adams, W. I. Clarke, E. Foster, W. M. Hargreaves, L. J. Neale (May 10) ; M. V. Gibbon (May 12).

The follg. are promoted with effect from June 1 :—

*Flight Lieuts. to be Sqd. Ldrs.*—D. S. Earp, D.F.C., C. Crawford, P. R. T. J. Michael, I. C. Chamberlayne, A.F.C., H. E. Walker, M.C., D.F.C., J. Cottle, M.B.E., D.F.C., F. J. W. Mellersh, A.F.C., L. M. Elworthy, A. R. M. Rickards, O.B.E., A.F.C., R. St. H. Clarke, A.F.C., T. A. Langford-Sainsbury, D.F.C., A.F.C., S. Graham, M.C., A. B. Ellwood, D.S.C., S. D. Culley, D.S.O., J. MacG. Fairweather, D.F.C.

*Flying Officers to be Flight Lieuts.*—M. J. Du Cray, P. McK. Terry, A.F.C., B. W. Knox, H. A. J. de S. Barrow, H. C. Marett, R. K. Hamblin, M. G. Philpott, A. M. Stevens, V. B. J. Jackson, B. G. Farrow, W. L. Freebody, H. Waring, J. C. Cunningham, W. G. Abrams, R. F. Part, H. H. Martin, J. W. Gillan, T. H. Downes, J. G. Elton, J. B. Veal, P. H. Smith, C. H. Appleton, V. D. Morshead, N. A. Pearce, H. Broadhurst, I. McL. Cameron.

Wing Commdr. A. F. A. Hooper, O.B.E., is restored to full pay from half-pay (May 31) ; Wing Commdr. G. B. Dacre, D.S.O., ceases to be seconded for duty as Adviser to Greek Ministry of Aviation and relinquishes acting rank of Group Capt. (May 20).

*Stores Branch*

The follg. are promoted with effect from June 1 —

*Flight Lieuts. to be Sqdn. Ldrs.*—T. S. James, A. G. Knight, M.B.E., R. A. Young, H. E. Tansley, M.C. *Flying Officers to be Flight Lieuts.*—F. R. Lines, L. L. Bray, C. S. Whellock, M. F. Tomkins, L. V. Hirst, J. R. R. Harvey, M.M.

Flt. Lieut. L. N. Sargent is placed on retired list (June 7).

### ROYAL AIR FORCE RESERVE
### RESERVE OF AIR FORCE OFFICERS

*General Duties Branch*

Pilot Officer J. S. Sheppard is promoted to rank of Flying Officer (June 5).

The follg. are transferred from Class A to Class C :—Flight Lieut. I. M. Matheson (July 14, 1931). Flying Officers A. R. M. Brain (Nov. 15, 1931) ; H. L. Christie (March 1) ; E. E. Fresson (May 17) ; W. L. Woodward (May 22).

F/O. J. D. Parkinson is transferred from Class C to Class AA (i) (May 18) ; F/O. C. Hole relinquishes his commn. on account of ill-health (June 8). The follg. F/O.s relinquish their commns. on completion of service :—S. B. Atkinson (May 20) ; E. F. Rhodes (June 8). Flt. Lt. C. Musgrave, A.F.C., relinquishes his commn. on completion of service and is permitted to retain his rank (Dec. 5, 1931).

*Medical Branch*

F/O. J. M. Fosbrooke, M.B., Ch.B., relinquishes his commn. on completion of service (May 31).

### AUXILIARY AIR FORCE

*General Duties Branch*

No. 600 (City of London) (Bomber) Squadron.—P/O. G. F. Anderson is promoted to rank of Flying Officer (May 10).

*Medical Branch*

No. 600 (City of London) (Bomber) Squadron.—F/O. H. W. Walter, M.D., B.S., is promoted to rank of Flt. Lt. (Dec. 12, 1931).

## ROYAL AIR FORCE INTELLIGENCE

**Appointments.**—The following appointments in the Royal Air Force are notified :—

*General Duties Branch*

*Wing Commanders :* L. M. Bailey, A.F.C., to R.A.F. Base, Gosport, 30.5.32, for administrative duties vice Wing.-Com. E. O. Grenfell, M.C., D.F.C., A.F.C. A. F. A. Hooper, O.B.E., to R.A.F. Base, Calshot, 31.5.32, for administrative duties. E. O. Grenfell, M.C., D.F.C., A.F.C., to R.A.F. Base, Gosport, 6.6.32, for flying duties vice Wing-Com. G. W. Robarts, M.C.

*Squadron Leader* E. H. Hooper, to H.Q., Middle East, Cairo, 3.6.32, for Personal Staff duties.

*Flight Lieutenants :* C. N. Ellen, D.F.C., to No. 20 (A.C.) Sqdn., Peshawar, India, 26.5.32. J. R. Bell, D.F.C., to No. 99 (B.) Sqdn., Upper Heyford, 21.5.32. J. Rodger, D.S.M., to R.A.F. Base, Calshot, 30.5.32. H. P. G. Leigh, to Home Aircraft Depot, Henlow, 6.6.32. G. H. Russell, D.F.C., to No. 503 (County of Lincoln) (B.) Sqdn., Waddington, 28.5.32. E. A. McKinley-Hay, to Aircraft Depot, Karachi, India, 11.5.32. M. H. Ely, to Station H.Q., Mount Batten, 1.6.32. E. A. Hodgson, to Station H.Q., Heliopolis, Egypt, 3.6.32.

*Flying Officers :* A. H. Garland, to No. 31 (A.C.) Sqdn., Quetta, India, 26.5.32. W. C. Sheen, to Central Flying School, Wittering, 27.5.32. A. N. E. Hall, to No. 2 Armoured Car Co., Ramleh, 5.3.32. L. P. Rowley, to No. 14 (B.) Sqdn., Amman, Palestine, 18.5.32.

*Pilot Officers :* T. H. L. Nicholls, to No. 30 (B.) Sqdn., Mosul, Iraq, 18.5.32. A. Threapleton, to No. 70 (B.T.) Sqdn., Hinaidi, Iraq, 18.5.32.

*Stores Branch*

*Squadron Leader* M. J. James, M.B.E., to R.A.F. Depot, Uxbridge, 4.6.32, for Stores duties vice Sqd.-Ldr. A. T. Cooper.

*Flight Lieutenant* S. R. L. Poole, to Station H.Q., Kenley, 2.6.32.

*Accountant Branch*

*Flight Lieutenant* R. C. Clayton, to Station H.Q., North Weald, 4.6.32.

*Medical Branch*

*Flight Lieutenant* A. Sheehan, to Station H.Q., Hornchurch, 7.6.32.

*Flying Officer* R. L. Raymond, to Central Med. Estab., 24.6.32.

*Dental Branch*

*Flying Officer* J. E. Willoughby, to No. 1 School of Tech. Training (Apprentices), Halton, 1.6.32.

*Chaplains Branch*

Rev. H. F. Daniels, to No. 6 (B.) Sqdn., Ismailia, 6.5.32. for duty as Chaplain (Wesleyan), instead of as previously notified, 19.5.32.

### NAVAL APPOINTMENTS

The following appointments have been made by the Admiralty :—

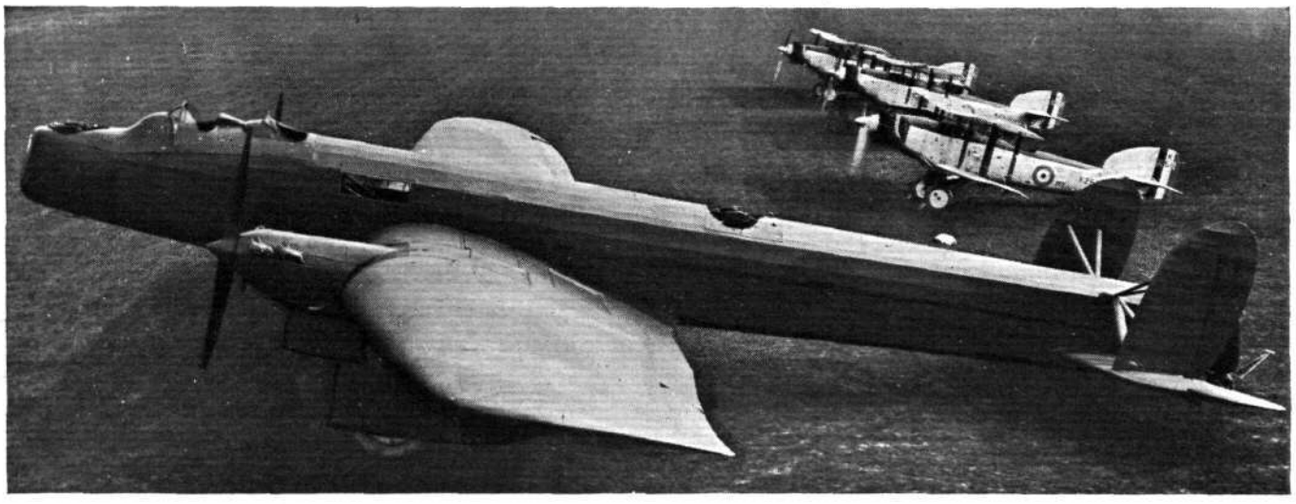
*Lieutenant (Flying-Officer, R.A.F.)* J. C. Cockburn, to *Cumberland*, for 403 Flight (April 23).

*Retirement*

*Lieutenant-Commander (Flying-Officer, R.A.F.)* R. H. S. Roundell, placed on Retired List, at own request (June 1).

*Royal Air Force*

*Pilot Officer* F. E. Stokes, to *Hermes*, for 403 Flight (May 27).



**ANOTHER NEW AIRCRAFT TYPE WHICH WILL BE SEEN AT THE DISPLAY AT HENDON ON JUNE 25 : The Fairey Night Bomber (two Rolls-Royce " Kestrel " engines) is the only monoplane among the new machines of this class. It has a wing span of more than 100 ft., and the gross weight is 19,050 lb. Other new types illustrated on pp. 531-533.**

# THE INDUSTRY

## SAFETY GLASS

TRIPLEX Safety Glass was originally introduced into this country from France. It was in the year 1903 that a scientist named Edouard Benedictus dropped a flask on the floor and was amazed to find that no broken pieces of glass came away from it. That flask had previously contained nitrocellulose, a film of which still adhered to the inside. Later in the year Benedictus was stirred to thought and recollection of this incident by reading of a motoring accident in which a girl had been badly cut by broken glass. The germ of the idea was then born, but it was not until 1909 that he first took out patents, and the Société du Verre Triplex was formed.

The English Triplex Safety Glass Co., Ltd., was formed in 1912 by Mr. R. Delpech, with Mr. W. R. Lyttleton, and with the start of the war its production found an inexhaustible market. The methods of safety glass manufacture are many, but that used by the Triplex Safety Glass Co. at their King's Norton factory near Birmingham has proved to be most efficient in securing an absolutely uniform product, which to-day is in use not only for the majority of motor-cars throughout the world, but also for an increasingly large number of aircraft.

The first stage is to wash and dry the glass, after it has been inspected most rigorously for blemishes of any kind. The sheets are then coated with gelatine and dried again. The next step is to coat the gelatined sheets with yet a further coating, this time of a cellulose lacquer, generally called enamel in the factory. Both these processes require the most careful regulation and control, particularly of the drying, in order that uniform results may be obtained. The coated sheets are then passed through a Vee-shaped conveyor with a sheet of celluloid between them; this celluloid—a cellulose nitrate in the case of Triplex—is reversed during its journey, and at the end it and both the sheets have been sprayed with an inert liquid which, after the whole has been formed into a sandwich by passing through a squeegee, prevents the inclusion of air bubbles. This sandwich is then pressed. Two methods are used for this at King's Norton, the first being in a heated flat hydraulic press and the second in an autoclave. This latter is an interesting process which, on the face of it, should not work, yet it does so by distributing the included liquid throughout the body of the sandwich and forcing the plastic celluloid to conform to the glass. At King's Norton the sandwiches are stacked in trolleys and wheeled into the body of the autoclave, where they are first subjected to air pressure for 5 min. and then to hot liquid pressure for a similar period. Little now remains to be done except to seal the edges and grind them smooth. Sealing is done to prevent the entry of moisture, which will naturally rapidly break down the adhesion and render the glass useless. With a cellulose nitrate interlayer, this is particularly necessary because the interlayer breaks down under the action of light, and in doing so generates gas which blows holes, which in turn would allow moisture to enter. The sealing compound used here is an asphaltic bitumen, which is squirted into the edge after the celluloid has been burned out for a depth of $\frac{1}{8}$ in. all round the sheet. Finally, the edges are ground down and polished according to the work for which the glass is required. Throughout the whole manufacture the greatest trouble is taken to test samples and ensure a uniform standard. The first is the Brittleness and Adhesion Test; in this an iron ball is dropped on to a test sheet, and from the result it can easily be seen whether or not the adhesion is good or whether the glass is brittle. Other tests include those for the formation of bubbles and blisters; for the efficiency of the sealing; for discoloration and appearance, etc.

The most recent developments would point to safety glass being manufactured from polymerised resins, such as the polyacrylic acid esters, which are run on to the sheets of glass in solution. These esters are impervious to the action of light, and are far more elastic than cellulose acetate or nitrate, and when the manufacturing difficulties have been overcome their use appears probable.

An interesting experiment has recently been carried out at King's Norton which has a direct bearing on the use of safety glass for aircraft; this was the manufacture of a "Sandwich" from two sheets of glass each only a fraction of a millimetre thick. The result was excellent, and it seems possible that by the use of thicker celluloid and thinner glass, safety glass of suitable weight for general aircraft use may soon be within our reach. Such thin glass would also be of great value for goggles and for instrument dial faces.

## IMPORTS AND EXPORTS

AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910).

For 1910 and 1911 figures see FLIGHT for January 25, 1912.
For 1912 and 1913, see FLIGHT for January 17, 1914.
For 1914, see FLIGHT for January 15, 1915, and so on yearly, the figures for 1930 being given in FLIGHT, January 16, 1931.

| | Imports. | | Exports. | | Re-exports. | |
|---|---|---|---|---|---|---|
| | 1931. | 1932. | 1931. | 1932. | 1931. | 1932. |
| | £ | £ | £ | £ | £ | £ |
| Jan. ... | 7,965 | 2,456 | 142,596 | 122,942 | 1,074 | 863 |
| Feb. ... | 3,303 | 2,503 | 110,587 | 181,482 | 1,293 | 90 |
| Mar. ... | 5,615 | 1,946 | 83,088 | 167,195 | 3,441 | 200 |
| April | 2,216 | 622 | 213,401 | 142,145 | 530 | 1,128 |
| May | 1,964 | 1,747 | 275,382 | 138,356 | 108 | 5 |
| | 21,063 | 9,274 | 825,054 | 752,120 | 6,536 | 2,286 |

## PUBLICATIONS RECEIVED

*Aeronautical Research Committee Reports and Memoranda: No.* 1421. *Spinning of a Single-seater Fighter with Deepened Body and Raised Tailplane. Part I. Model Experiments:* by H. B. Irving and A. S. Batson. *Part II. Full-Scale Spinning Tests;* by A. V. Stephens. Dec., 1931. Price 1*s.* 3*d.* net. *No.* 1443. *Wind Tunnel Tests on Aileron Loads.* By F. B. Bradfield, G. F. Midwood and F. R. C. Hounsfield. Sept., 1931. Price 1*s.* 3*d.* net. London: H.M. Stationery Office, W.C.2.

*Aluminium: Its Production, Properties, and Applications.* The British Aluminium Co., Ltd., Adelaide House, King William Street, London, E.C.4.

*How to Drive a Car.* By the Editor of *The Motor.* London: Temple Press, Ltd. Price 2*s.* 6*d.* net.

*All Square with Fate.* By T. C. St. C. Morton and Ladbroke Black. London: Ivor Nicholson and Watson, Ltd. Price 7*s.* 6*d.* net.

*Aluminium Sheet Metal Work.* The British Aluminium Co., Ltd., Adelaide House, King William Street, London, E.C.4.

*Tin Soldiers.* By S. J. Nightingale. British Non-Ferrous Metals Research Association, Regnart Buildings, Euston Street, London, N.W.1. Price 5*s.* net.

*Economic Conditions in Norway, March,* 1932. Report by C. L. Paul, C.B.E. Department of Overseas Trade. *No.* 514. London: H.M. Stationery Office, W.C.2. Price 2*s.* 3*d.* net.

## AERONAUTICAL PATENT SPECIFICATIONS

*Abbreviations:* Cyl. = cylinder; i.c. = internal combustion; m. = motors. (The numbers in brackets are those under which the Specification will be printed and abridged, etc.).

### APPLIED FOR IN 1930

*Published June* 16, 1932

35,009. SPERRY GYROSCOPE CO., INC. Steering of dirigible craft. (373,236.)

### APPLIED FOR IN 1931

*Published June* 16, 1932

4,538. V. EHMIG. I.-c. engines for use on aircraft. (373,130.)
4,572. E. G. BUDD MANUFACTURING CO. Trusses for use in aircraft. (373,188.)
4,716. E. G. BUDD MANUFACTURING CO. Trusses, particularly for use in aircraft structures. (373,214.)
15,286. GLOSTER AIRCRAFT CO., LTD., and F. DUNCANSON. Aircraft wings fitted with engine-cooling devices. (373,410.)

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